THE MOTIVE POWER OF THE "DEUTSCHLAND"

An Interview With H. Kleis, Chief Engineer, Accompanied by Exclusive Photographs

25 CENTS

MOTORSHIP

(Trade Mark Registered U. S. Patent Office.)

In the Interests of Commercial Motor Vessels

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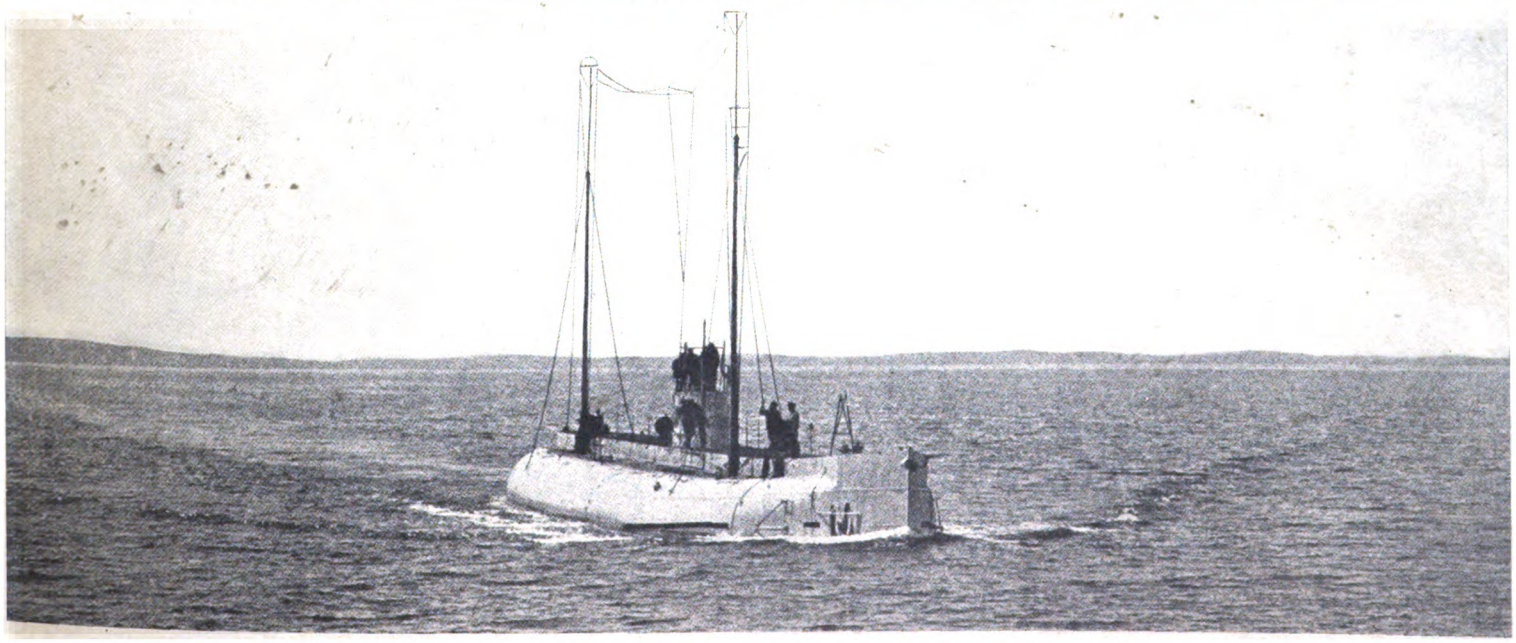

THE "DEUTSCHLAND" AND HER ENGINE ROOM STAFF

Above—Photograph of Engine Room Staff Taken on Deck of "Deutschland" at New London Exclusively for Motorship. Left to Right—Huktsch, Assistant Engineer; Nagel, Assistant Engineer; Kiesling, Third Engineer; Muhle, Assistant Engineer; Kleis, First Engineer; Albers, Second Engineer; Schulz, Assistant Engineer; Zimmer, Assistant Engineer. Below—"Deutschland" on Her Official Trial Trip.

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The Motive Power of the M. S. "Deutschland"

By Russell Palmer

Editorial Note: MOTORSHIP is glad to be able, through the courtesy of officials of the Deutsche Ozean Rhederei G. m. b. H., to place before its readers an authoritative description of the motive power of the merchant submarine "Deutschland" operated by that line. No information of this character pertaining to the "Deutschland" has been given out before either in Germany or the United States. As a consequence considerable speculation has been indulged in both at home and abroad as to the make and type of Diesel motors with which this unique carrier was fitted. The following article answers both of these questions once and for all and adds some interesting information as to how the vessel performed on her first three transatlantic voyages. Mr. Palmer's article is based upon a personal interview with Chief Engineer H. Kleis of the Deutschland, at New London, Conn., on November 6th.

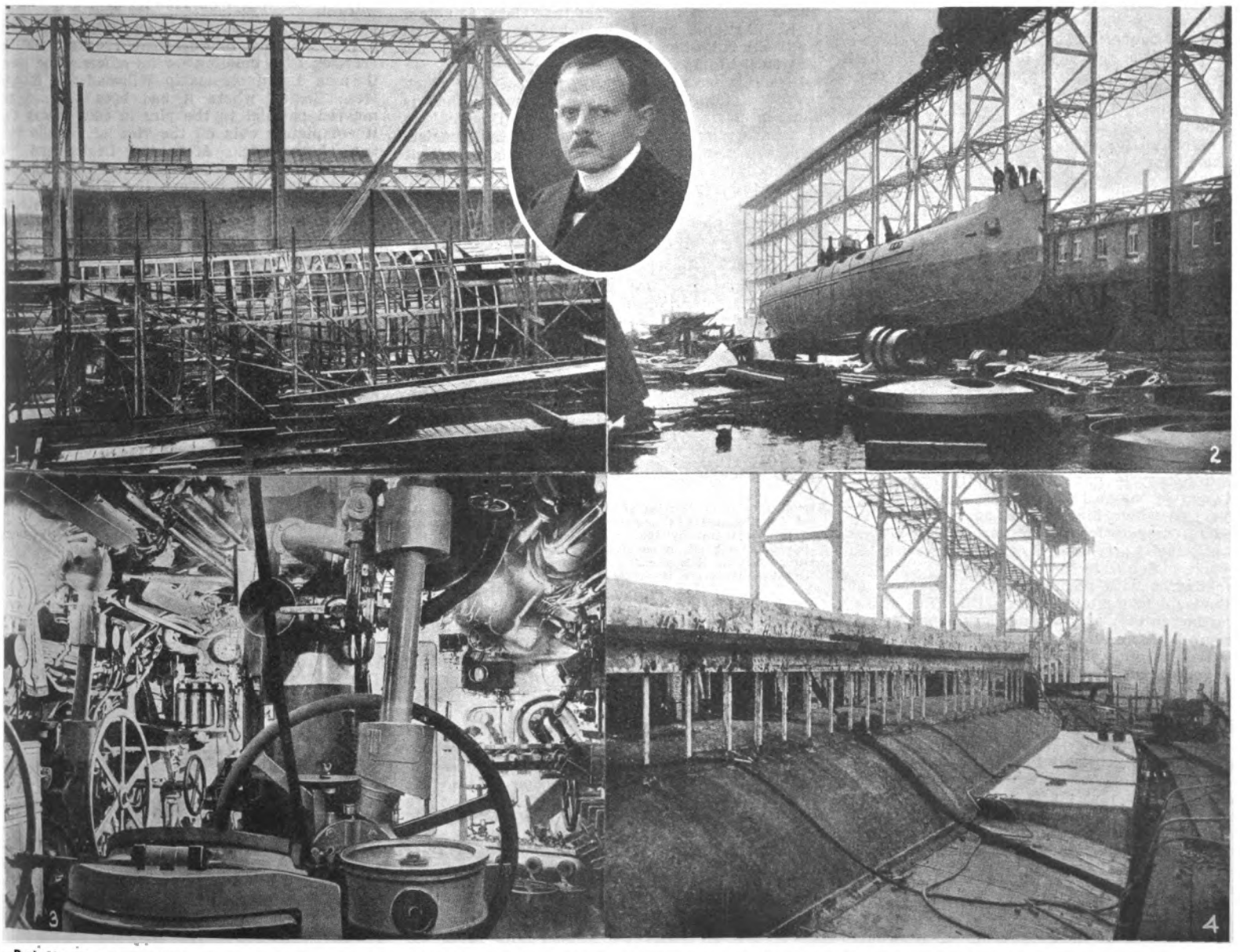
Fewer single events of the Great War have attracted more attention than the arrival at Baltimore on July 9th, 1916, of the submersible merchantman "Deutschland." Aside from those branches of industry whose acute condition was somewhat relieved by the cargo which the vessel brought, nowhere in the industrial world did the newcomer arouse such interest as in the motorship field. Her remarkable trip, since surpassed by that of the naval submarine U-53 which crossed the Atlantic and returned to her German base without really touching here, had the effect of impressing the dependability of the oil engine upon many ship owners who had set their faces against progress. It has furnished the exponents of the Diesel engine with a convincing and prominent example of what power of that type can achieve.

Despite reams of printed matter which chronicled the "Deutschland's" arrival the careful observer could detect very little concrete informtaion and it, meagre though it was, was unsubstantiated. The question immediately arose as to what make and type of Diesel motor propelled the craft. Motorship, which published what was unquestionably the most circumstantial account of the vessel, which has appeared in this country, ventured the opinion at the time that since the vessel had been built by Fr. Krupp A. G. at Germaniawerf, Kiel Gaarten, it was altogether probable that Krupp motors had been installed and that these were no doubt of the two-cycle bronze constructed type, built for the German navy by this concern in the past. At the same time, however, there was current a report that the engines were in fact of the M. A. N. two-cycle type.

It now develops that neither report could be entirely credited. One is partially correct and the other must be retired to the limbo, where rests the story that the Deutschland is a converted naval submarine. H. Kleis, chief engineer of the Deutschland, and the man whom all marine men will instinctively credit with a large part of the vessel's success, states to Motorship that, as we conjectured, the engines were of the Krupp make, and indeed this may in no way be considered as reflecting upon the Nurnburg engines, for it would have been illogical to assume that the owners would have contracted for hull construction with a builder to whom they could not also give the engine contract. That the Deutschland's Krupp engines are of the four-cycle type will, however, come as a surprise to most engineers who have followed that firm's Diesel development only prior to the war.

Herr Kleis is also authority for the statement that Krupp naval submarines engines are now built in both four and two-cycle types and that the famous Krupp bronze construction has been retained only in the two-cycle motors, the four-cycle motors being built of steel and cast iron. What the proportion of the current output is Herr Kleis cannot say. It depends on what the government calls for in individual specifications.

"The Deutschland," says her chief engineer, "is fitted with two, six-cylinder, four-cycle Krupp motors developing 600 b. h. p. each at 380 revolu-



1.—Deutschland in frame at Kiel. 2.—Deutschland ready for launching last March. Shows clearly she is not a fighting boat. Has the bow of regular steamer. No torpedo tube openings. 3.—Deutschland's central control station. 4.—Hull plating completed. Ready for deck plates. Shows both inner and outer hulls. Appearing in the oval is Gotthold Prusse, who superintended loading of Deutschland and who came over on her first trip.

tions. These engines were designed specially for the Deutsche Ozean Rhoderei, G. m. b. H., her owners. They are smaller than the regular Krupp submarine engine, somewhat simpler in construction and contain several features not to be found in the standard type. The submarine engine of the same make develops from 1,200 to 1,500 b. h. p. per unit at 500 revolutions so it will be seen that there is no truth in the story that she is fitted with cast off submarine engines.

"The cylinders have a bore of 45 centimeters (17.35 inches) and a stroke of 60 centimeters (23.4 inches). Compared to the naval submarines the Deutschland is an easy going merchantman with ample cylinder space and slow speed. (Subsequently Herr Kleis modified these dimensions to 40 centimeters (15.6 inches) by 50 centimenters (19.5 inches). It does not off hand seem reasonable that an error should be made in these figures but Motorship does not wish to do an injustice so both figures appear here.

"These engines have a considerable range in speed. They can be operated at from 200 to 400 r. p. m. and it will be noted that the ordinary operating speed of 380 r. p. m. is not far from the maximum. A special attachment to the fuel injection valve permits it to be adjusted (when the engine is at a stand still) for each a high or low general range of speed. Pressure in the cylinders at the moment of fuel injection is from 42 to 45 atmospheres.

"The Deutschland's motors are not of the special Krupp bronze construction, but are of steel and iron. Steel being used in the cylinder head and crank case and the cylinders being of the usual cast iron and having removable linings of the same metal. What the life of these linings are we do not know not yet having had occasion to replace one in three trips. Krupp has retained bronze construction in two-cycle motors to increase their life and eliminate trouble but no longer makes the four-cycle motor of this material. I am unable off hand to give the weight per horse power of our engines.

"The Deutschland's motors have performed admirably and reflect great credit upon the designers and builders. They have given no trouble whatever. Upon return to Bremen after the first round trip they were taken down and very thoroughly inspected, but aside from grinding some of the valves and tightening the bearings there was nothing to do. We have absolutely no cracked pistons or cylinder trouble. In considering the performance of the engines it is interesting to note that they are operated practically continuously while the vessel is on the surface. Our record non-stop run is 245 hours and even then it was a cause other than anything arising in the engine that caused us to stop. On the first round trip the engines turned over more than 11,000,000 times.

"American oil was used for the return trip, but from what field it came I do not know. I can only say that it gave entire satisfaction and we arrived with the cylinder walls in perfect condition."

When Herr Kleis was informed that the news that his vessel was fitted with four-cycle engines instead of two-cycle would be received with considerable interest in this country because of question of the merits of the two types he remarked:

"The four-cycle engine is rapidly succeeding the two-cycle engine in Germany. The latter has its function where high speed and power are required in compact form under special conditions such as naval work, but for commercial work the four-cycle motor is in the ascendancy."

The figures with regard to the dimensions of the Deutschland's motors as given by Herr Kleis, interesting as they are, will not be accepted without some little question on the part of those who have given careful thought to the basic conditions which surround the design and operation of Diesel engines.

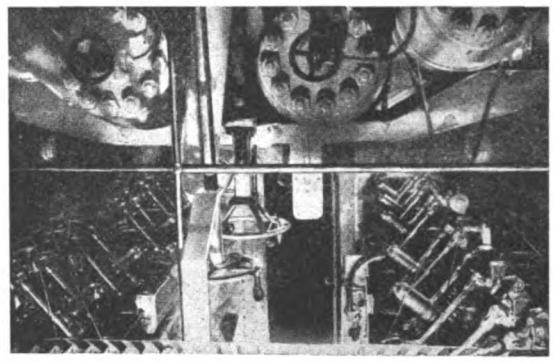
It will be observed that two distinct sets of engine dimensions were given by Herr Kleis in the course of the interview and the writer is personally inclined to credit the first set of figures since these were given freely in an off hand way when the question was first asked and it is unreasonable to assume that a man in Herr Kleis's position would err in citing these figures, particularly when they were given in metric figures, a scale with which he was, of course, accustomed to compute. On the other hand it is not unlikely that mature consideration of the matter by those officials who have shaped the American policy of the Deutsche Ozean Rhederei G. m. b. H. would be conducive to the belief that the Deutschland's engineer had been a little too frank.

Assuming that the figures given by Herr Kleis before consulting his superiors are correct it would naturally follow that the Deutschland's engines would develop her accredited horse power, 600 b. h. p. at somewhat less than 200 r. p. m., the figure given by her engineer as the minimum speed. It would moreover be impractical to operate an engine of such extremely long stroke at more than about 275 r. p. m. at which speed the engine would develop about 900 b. h. p. and would have a piston speed of roughly 1,100 feet per minute rate which any practical designer would hesitate to impose. The accredited maximum speed as given by Herr Kleis would entail a piston speed of nearly 1,600 feet per minute and if it were physically possible to crowd metal to this point the engine would yield almost 1,300 b. h. p.!

Since Herr Kleis' second set of cylinder dimensions are not sufficiently smaller to correct these improbabilities the only remaining conclusion is that it must be 280 r. p. m. to which he referred. Granting this there still remains the fact that an engine with a stroke of 60 centimeters would be nine feet high. This, however, would not be impossible as the Deutschland has a generous beam to give her the cargo carrying capacity so essential to her work.

Without in the least detracting from Captain Konig's achievement as a navigator it may be said that the lion's share of the credit for the Deutschland's three voyages belongs to Herr Kleis and his staff. The engine room is after all the vital heart of the vessel and it is pleasing to note that Captain Konig when apprised of Motorship's intention of discussing the voyage from the engine room standpoint said of the black squad, "They are the fellows who deserve the credit." The general public, however, seldom thinks as far as this. We recall the recent burning off the Oregon coast of the SS. Congress following which the daily press published ream upon ream of eulogy of her commander, Capt. N. E. Cousins, all of which the captain doubtless deserves, while buried in the addenda of the stories was a few lines to the effect that Chief Engineer B. K. Martland, had to be taken to the hospital for treatment when landed as he had stuck to his post until the flames reached him.

It is this unseen, unsung loyalty of the "black squad" which is responsible for much that is finest in marine achievement and the Deutschland is no exception. Her engine room staff consists of picked men, trained either in the government service or at the Krupp yards. No one of them is over thirty years of age and they are physical-



The only print in America of the only photograph ever made of the Deutschland's engine room. That the engines are Krupp is shown by the beveled cylinder head with fuel injection valve set in on angle. This is unique feature of Krupp motor. It is also apparent from double valve mechanism that these are four-cycle motors.

ly a fine lot. The organization is headed by Herr Kleis, whose official title is first engineer officer, assisted by Second Engineer Officer Fruchte and Third Engineer Officer Kiesling with six engineer assistants, Hultsch, Nagel, Muhle, Albers, Schulz and Zimmer.

That the Deutschland, limited as she is to space, is not altogether devoid of comforts is shown by the photographs reproduced elsewhere which shows the officers' mess on board the vessel. The principal trial in addition to the fact that all of the usual hardships of seafaring are accentuated by the size and shape of the Deutschland, is from the lack of ventilation and the noise of the motors operating in a confined space. Happily both these have been reduced to a minimum in the case of the Deutschland whose engines run with remarkable quietness.

On her return trip from Baltimore the Deutschland arrived on the Weser, August 23rd. Arrangements were made to dispatch her within a week, her health certificate having been issued by Fr. Hoyermann, American vice-consul at Bremen on September 30th. She was ready to go to sea again on October 1st, but was held until the tenth for possible word concerning the Bremen.

The officers of the Deutschland are certain that the Bremen was not captured but foundered, possibly as a result of mechanical trouble. A third vessel of the line, the Amerika, is expected before long.

The last voyage of the Deutschland consumed twenty-one days being somewhat retarded by bad weather.

Gotthold Prusse, of the engineering staff of Fr. Krupp, who came over on the Deutschland on the first trip, has remained in this country and is superintending the work of stowing the vessel's cargo, a delicate operation. Mr. Prusse is living in New London.

NOTES ON THE DEUTSCHLAND'S SECOND VISIT.

The choice of New London for an American terminus by the Deutsche Ozean Rhederei G. m. b. H. was a very happy one as the natural facilities of the harbor lend itself particularly well to submarine navigation. The fact that it is the location of the American naval submarine base and the plant of the New London Ship & Engine Co., which has furnished Diesel engines for practically all of the U. S. government submarines bears out this statement. The value of the port for the purposes of the Deutschland's owners is further enhanced by the fact that these related activities are already there. Submarines from the naval base pass in and out of the harbor many times daily so that the arrival or departure of a submarine is not conspicuous. The fact that New London is the location of America's largest Diesel engine plant makes it an ideal spot for executing any repairs to the vessel's motive power which might be necessary.

Those who have not visited the spot will be somewhat interested in the arrangements made for berthing the Deutschland. The Eastern Forwarding Co. has leased 35,000 square feet of the new state pier at East New London and spent $14,000 in the improvement of the dock and erection of a building for its offices. The North German Lloyd steamship Willehad was brought from Boston where it had been interned and moored parallel to the pier in such a way that it completely cuts off the view of the slip from the shore side. After the Deutschland was moored a large wooden screen on floats was towed into place between the Willehad and the outer end of the pier so that a complete enclosure was formed about the vessel. Thousands of people, many of them ardently patriotic Teutons, journeyed from all over the East to see the strange carrier but were forced to return without as much as a glimpse. Barbed wire fencing kept out even the most venturesome, while policemen and sailors from the Willehad acted as sentries at all of the recognized entrances. Captain Konig and his staff were quartered on board the Willehad. Telephones connected the Deutschland and Willehad with the office on the dock. All of the arrangements were made in a most business-like way.

Paul G. L. Hilken, vice-president of the Eastern Forwarding Co., and Captain Frederick Hinsch, the superintendent, are to be congratulated for the very capable manner in which they have executed what to the average shipping man would be a most ticklish commission. Paul Hilken had the distinction of visiting the Deutschland when she was still in frame at Kiel Gaarten early this year, returning later to this country to make the arrangements for receiving her. Few young men of Mr. Hilken's age have borne equal responsibilities in the quiet, capable fashion which has distinguished his work in connection with the Deutschland and it is to be hoped that when the termination of war makes unnecessary commercial submarine operations that the shipping world will be the scene of his further activities. Let us hope that when this day comes that these talents will be turned to motorshipping.

TEMPLE SHIPBUILDING COMPANY.

Incorporated at $100,000. Yards at Port Blakeley. Will operate under the management of B. H. Temple, recently of Vancouver, B. C. It is the intention of the company to specialize in building a standard type of wooden auxiliary motor schooner. W. L. Waters, a Seattle attorney, and F. J. Linne, president of the Standard Ice company also of this city, are named as executive officials. To this and other bona fide projects Motorship extends its good wishes.

M. S. Deutschland's Motors

The author of this communication is attached to the New York office of the American Krupp System Diesel Engine Co., and representing the "Germania" Oil Motors as built by Fried Krupp Aktiengesellschaff Germaniawerft, Kiel Gaarden.

New York City, November 18, 1916.

To the Editor of "Motorship"

Dear Sir—Since my conversation with your Mr. Russell Palmer yesterday I have taken the trouble to go very carefully into the matter of the twin six-cylinder four-cycle Diesel engines that the Krupps have in all probability installed as the main driving engines of the submarine trader "Deutschland." To begin with: The power needed by this vessel to attain a speed between 12 and 14 knots is, in all likelihood, 1,500 to 1,800 s. h. p., and not 1,200 s. h. p. as has been frequently stated. This assertion is based on the well known Admiralty co-efficient formula: $S.-H.\ P.=1/K.D^2/3.V^3$, in which D is displacement in tons, V is speed in knots per hour and S. H. P. is shaft horsepower. 1/K is taken to be approximately the same in all the Krupp submarines. We are obliged to make this assumption, because we are without accurate data as to the trials of the model of this boat; she should be harder to drive than a naval submarine, because she is a freight-ship. The standard German submarine is generally believed to be of 800 tons displacement and capable of going at the rate of 17 knots under the full power impulse of her Krupp 850 s. h. p. twin six-cylinder Diesel engines. The "Deutschland" cannot have a displacement less than 2,000 tons to carry the cargoes she is credited with. Substituting these figures in the above formula we get: $(2000)^{2/3} \times (14)^3 = (800)^{2/3} \times (17)^3$ almost exactly. That is to say the "Deutschland" probably needs at least as much power to go 14 knots as the standard German Naval submarine requires for 17 knots. For that reason I am prepared to believe that you were correctly informed at New London as to the bore and stroke of the engines. Two six-cylinder Krupp four-cycle Diesel-engines having cylinder bores of 42 cm. and piston strokes of 55 cm. would be easily capable of yielding 1,500 s. h. p. at 300 r. p. m. The piston speed would be 5.5 metres per second, which is high but not excessive, and the Pe (mean effective card pressure multiplied by the factor of mechanical efficiency) would be less than 5 kgs. per square cm. Such engines operated at such speed should, in the hands of competent men, give no trouble; the piston speed is higher than Krupp uses for high-speed Diesel-engines driving dynamos in light and power stations however. The other size given you at New London, cylinder bore 45 cm. and stroke 60 cm. would be an excellent proportion for a four-cycle high-speed Diesel-engine. Two such six-cylinder four-cycle Diesel-engines operating at 280 r. p. m. would yield 1,800 s. h. p. The piston speed in this latter engine is 5.6 meters per second and the Pe is 5.05 kg. per qcm. I am of the opinion that one of the two engines outlined above is substantially the duplicate of the two main Diesel-engines in the "Deutschland." Of one thing you can be certain. If either of the above engines represent the main engines of the 'Deutschland" the r. p. m. cannot safely exceed the figures I have given, as 4.5 metres piston speed per second is much better practice for continuous running than 5.6 metres per second. The former figure is not often exceeded in power and light stations with Krupp high-speed stationary Diesel-engines.

Very sincerely yours,
JOHN L. BOGERT,
Consulting Engineer.

BARNES SHIPYARD PLANS.

The J. D. Barnes Shipbuilding company expects to have work definitely under way within the next month on the plant on its waterfront land in Alameda, where two motorships are to be built for the San Francisco-Hongkong Steamship company. A newspaper report recently came out that this company had closed contracts for eight ships, but Mr. Barnes states that this is greatly exaggerated, and his plans for the future are by no means definite.

IMPERIAL COMPANY DISSOLVED.

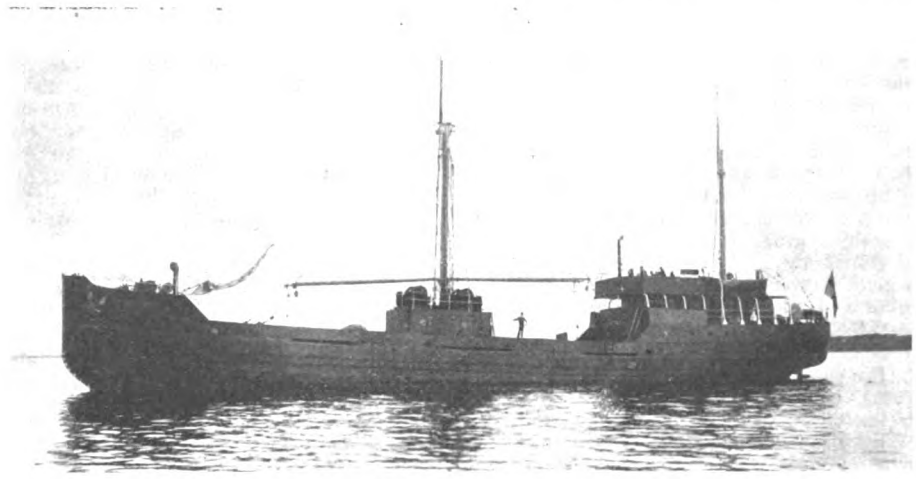
The Imperial Gas Engine company of San Francisco, whose business was recently merged in the Atlas-Imperial Engine company, has applied for formal dissolution of corporation.

Sir J. Mills and the Motorship Development

"We may expect within a very few years to see steam-driven vessels take a secondary place among the mercantile navies of the world."

The above words of striking significance were given by Sir James Mills, K.C.M.G., the newly elected president of the Institute of Marine Engineers (Gt. Britain), in his maiden address on Sept. 5th, last. Coming from such an authority on the steam shipowning, shipbuilding, and marine steam-engineering developments, Sir James' remarks should be regarded most seriously by all shipowners. The following is an extract from his speech.

"But perhaps the most remarkable development of modern times is that of the internal combustion engine. We have seen—in the submarine for example—the high utility of this motor, where reliability can be associated with the remarkable economy in weight of fuel which characterizes the Diesel system. This type of marine engine for commercial purposes has already been fairly well tested in ships of moderate capacity, and we look forward to the advent of the vessels of larger size and greater power, which are now being built to provide a convincing test of what can be done in the way of high power in a commercial engine of this type. It seems fair to assume that if the anticipations of the builders of the ships of this class are realized, we may expect within a very few years to see steam-driven vessels take a secondary place among the mercantile navies of the world."



A QUAINT SWEDISH COASTAL MOTORSHIP

The illustration is of the Swedish coastal motorship "Ljusne Jernverk," which was placed in service several years ago. Her machinery consists of a 260 B. H. P. Polar two-cycle type Diesel engine. No records of her services are available, but there is no reason to assume that she was otherwise than most successful for the makers of the engine obtained very fine results with other craft of this type fitted with engines of about this power.

Sir James Mills is a New Zealander, well-known by his enterprise in connection with the Union Steamship Co., and his life work has been the building up of this great steamship company, having spent 40 years with this line. His company, in conjunction with the shipbuilding firm of Denny Bros., of Dumbarton, are said to be the first to make three great experiments, namely:

"(1) The building of the S. S. 'Rotomahana,' the first steel ocean-going steamship. A vessel which for very many years carried the title of the 'Greyhound of the Pacific,' was extremely popular, and is still doing good service in Australian waters.

"(2) Installation of electric light in a sea-going vessel the S. S. 'Manapouri.'

"(3) The building of the first foreign-going passenger steamship propelled by turbines the S. S. 'Loongana.' These three vessels were built in Dumbarton by the firm whose name we have already mentioned."

Let it be hoped that Sir James will show every confidence in his own opinions regarding the internal combustion engines by ordering a fleet of motorships which we fully expect he will do at the conclusion of the war, or as soon as the British ship-yards are free to undertake such work. Judging by the last line of this article he already has made a step in this direction.

In the reply to Sir James' address, Mr. J. T. Milton, the vice-president of the I. M. E. (chief engineer to Lloyd's Registry) included the following, viz:

"We, engineers, have been freer than most other professions in communicating our knowledge to each other, but I feel certain that we shall have to be still more free; manufacturers and users will have to co-operate as well, and will have to confer more than they ever did before. Now, **a new step has been taken in that direction in a field in which there will be strenuous competition.** I am referring to the British engineer and the internal combustion engine. If you reckon up the ships propelled by oil engines you will find that they are nearly all Continental. But the British oil engine will have to be the standard. The British engine makers have now combined and have agreed to pool any knowledge they may obtain for the mutual benefit of all. They will endeavor to obtain Government assistance in research work, but if it is not forthcoming they will go on with such work amongst themselves."

[This also must be the aim of American shipbuilders and shipowners. We now have the opportunity so let us use it.—Editor.]

"The way to learn is by overcoming failures. One firm has spontaneously offered to put before the others the complete technical history of a case in which considerable difficulties were encountered and surmounted. [For advocating this splendid policy Motorship already has been taken to task.] You have seen the report of the Advisory Committee for Scientific and Industrial Research. What is strongly impressed in the report is that in the industries of this country the work is mainly that of individual firms who are small as compared with the large combinations of interests to be met with on the Continent, and it will only be by co-operation that useful research work will be possible here, and this co-operation must be full and frank and must embrace not only manufacturers but also users, workers, and men of scientific training."

"If this can be carried out properly it will be a most essential thing for the industries of this country. I feel that Sir James Mills' address is not only of interest to us as Marine Engineers but must appeal to all leaders of industries. Research and the diffusion of knowledge obtained by overcoming difficulties is the source of all true knowledge and progress. I quite appreciate all I have heard about the **three** great experiments made by Sir James Mills mentioned in the letter we have heard read, but to this I should like to say that **he has recently added a fourth—a fine ship propelled at high speed and using oil fuel."**

Motorship earnestly appeals to all American heavy oil engine builders and motorship owners to follow the splendid policy put forward by Mr. J. T. Milton, who in his capacity as chief engineer to Lloyd's Registry of Shipping has come in personal contact with nearly every important motorship afloat and consequently is well acquainted with their faults and their various advantages. Yet he has, we understand, every confidence in the immediate future of the internal combustion engined ship.

England's Coastal Defense Motor Craft

Donald V. Hotchiss, As. Inst. N. A.
North Shields, England

The question of coastal defence by means of armed motor craft is engaging the attention of several nations at the present time, and the war has proved that the matter is one which can be developed to the advantage of the capital navy.

As regards Britain, the employment of motor patrol boats was never taken up seriously before the war. Now, however, the British admiralty, commencing in its methodical way, has gained a considerable amount of experience with this new means of frustrating the enemy's attempts at minor offensive operations against our coastal shipping and ports.

For some years there has been in existence a body called the Royal Naval Volunteer Reserve, which in time of peace comprised a fairly large number of enthusiastic amateurs, chiefly yachtsmen, who gave up a portion of their time to making themselves fit to be called upon for service in the Royal navy in time of war. This institution forms the backbone of the personnel of the large fleet of specially designed patrol boats now in use.

When the war broke out a large number of motor yacht owners offered their services to the country, and, in most cases the services of their crews. The boats also were placed at the disposal of the admiralty, and these were used for general purposes, that is to say, they carried out police work, carried dispatches, and did all kinds of odd jobs for the assistance of the Royal navy, Naval Air service, etc.

Some of the owners were granted temporary commissions in the R. N. V. R. and took command of their own boats, many other members of the R. N. V. R. were drafted to various other branches of the Naval service, and a large influx of new volunteers took place.

A large number of yachtsmen, feeling their services would be more useful in the army, joined this service. Now, however, that our army has grown to be numbered in millions, a number of these, having served for some time in France or Belgium, have obtained transfers—in some cases to commissioned rank in the branch of the service to which their natural inclinations and prewar training suit them best. It is hardly necessary to detail the many duties falling to the lot of patrol vessels. Suffice it that they are multifarious; the greatest value attaching to them lying in the fact that the waters adjacent to the coast are thoroughly policed by the patrol fleet, thus relieving the destroyer flotillas of a considerable amount of humdrum "beach combing"—as it is termed in the service.

The importance of the coastal patrol can be judged from the action of the British admiralty in supplementing the nondescript fleet by a large number of craft specially designed and built for the purpose. Of a large number of these nothing must be said for their use is a carefully kept secret. The fact of a mosquito fleet of armed motor boats, is, however, common knowledge throughout the world, and since other countries are working on similar lines in this matter, a few remarks about these motor craft may not be out of place.

Imagine, therefore, a flotilla of small high-speed craft continually searching sections of the coast for the tell-tale periscope of a hostile submarine. The first question likely to be asked will be: "but how do you tell your own submarines from the German?" Well, in the first place, we know the movements of our own submarines whilst there is such a thing as a secret challenge, which must be answered promptly and correctly, for the gun-layer with his eye glued to the telescopic sight is just itching to pull the firing lanyard or trigger. It is best to say nothing about the other means of "strafing" submarines possessed by the innocent looking patrol boat, suffice it that although there is room for improvement, they have the rosiest prospects of carrying out their mission. In spite of this fact, I firmly believe that very much better craft will be evolved in the future, and having been interested in the matter for a number of years I make an apology for a brief personal review of the question of coastal defence patrol boats. The matter resolves itself very much into a business transaction. On the one hand our coastal boats have to be sufficient in number and powerful enough to render the coasts secure against any submersibles which may be lucky enough to elude the vigilance of the Royal Navy. On the other hand we do not desire to divert more of the public funds than is absolutely necessary in keeping up a large number of units whose principal role is that of watching and waiting. Now submarines are worth at least £100,000 and £10,000 will purchase a very nice patrol boat fitted with appliances which might make the submarine decline the risk of a fight. The only object, therefore, in considering whether large boats would be more useful lies in the question of whether a large number of small boats or a smaller number of large boats would meet the case better. Submarines find it difficult to make an attack in any kind of rough weather, but on the other hand your patrol boat is by no means indifferent to the surface conditions.

Briefly, a small boat has the following disadvantages: In bad weather the surface type loses speed to the extent that it cannot carry out its proper functions, and the fine lined displacement type cuts through whatever waves come along, becoming wet and very difficult to fight; secondly, it is more often in for repairs than the larger craft, its life is shorter, the wear and tear being greater, and the officers and crew require longer periods of rest to recover from the exposure they endure. Lastly, it is not possible to carry such perfect signalling apparatus on a small as on a large boat.

The larger boat will have the following disadvantages: Increased first cost and cost of maintenance, greater draught of water, greater visibility.

If there be an error, it should be on the large side, for there is no question at all that a small destroyer or torpedo boat is the ideal coastal defence vessel, and the small patrol boat owes its existence to the principle of economy.

There are, however, one or two advantages enjoyed by the small patrol boat which should be borne in mind when considering the subject of the most suitable form of craft. These are principally the immunity from torpedo attack of the patrol boat, and the fact that its shallow draught also enables it to pass over mine fields without damage, if necessary. This latter operation could not be carried out safely in rough weather, but it is, of course, a great advantage to the crews of patrol boats to feel fairly safe from mines, whereas torpedo boats generally, and certainly destroyers, are just as liable to strike a mine as is a battleship.

Next there is the important question of armament. Many a small boat is able to carry weapons of offence which it cannot use to their full advantage by reason of its unsteadiness. This feature is the more apparent since it is absolutely necessary that a patrol boat should have a high turn of speed. In this connection, also, it is well to remember that a boat in service conditions seems to carry about twice the weight of stores and ammunition that can be ordinarily forecasted, so your little boat becomes a deeply laden, laboring craft, with small reserve buoyancy and speed.

Protection for submarines in the shape of armour and armament naturally follows any improvement introduced in the coastal vessels, therefore it is well to have some reserve displacement and if possible engine space, so that should it become necessary in a year or two to increase speed and armament a little, this can be effected witnout undue extra cost. In closing, under the apology made previously, I should like to draw attention to a design for a "Torpedo Motor Yacht," published by the English "Motor Ship and Motor Boat," in the year 1912 and taken before the admiralty by the writer. This showed a steel twin screw yacht on torpedo boat lines, 100 feet in length with 14 feet beam, armed with a six-pounder naval gun, and a single torpedo tube placed on deck right aft. The vessel was to be driven by two high-speed Diesel motors of 300 b. h. p., each running at 600 revolutions per minute, and the speed was to be 20 knots.

I proposed this vessel as the smallest which I considered capable of carrying out thoroughly efficient patrol service around our coasts. In the light of actual experience I see no reason to modify these figures, but a larger boat might be employed if developments in submarines rendered it advisable. In some designs for patrol boats published recently, I notice a tendency to copy too closely the proportions of an ocean-going destroyer of about 900 tons. This is wrong, for a small vessel of such small beam-to-length ratio is continually swept by seas and generally has a doubtful range of stability.

It is wrong to employ gasoline or any other highly expensive and inflammable spirit for fuel when the work can be done more safely and cheaply by heavy oil.

The idea of a volunteer coast patrol is an excellent one, for not only does it justify its existence in time of war, but it is also a splendid training school for a useful reserve of officers and men for the navy to draw upon in any time of emergency.

PRIVATE POWER CRAFT AND PREPAREDNESS.

A meeting of well-known men was held in New York on Nov. 3rd, and a new civilian defense was formed known as the Motor Craft Association, and the following officers were elected: Arthur Curtiss James, president; August Belmont, Jr., vice-president; J. A. Barnard, treasurer; J. K. Bartlett, secretary. The executive committee is made up of Ralph Pulitzer, H. S. Beardsley, L. H. Dyer, E. S. Willard, and H. I. Pratt. Among those present representing the navy were Commanders Charles P. Nelson, Louis A. Kaiser, and Robert K. Crank, and Lieutenants J. W. Wilcox and A. M. Cohen, all of whom commended the organization and pronounced that the movement was one which was bound to be of great benefit to the country in time of war.

The objects of the Motor Craft Association, which is in close affiliation with the Naval Training Association, are as follows:

1. To unite all owners of power craft possibly useful in time of war; to stimulate and develop the building of such craft; to encourage their enrollment in the Navy Department of the United States and the participation of the owners thereof, with due preparation in the annual maneuvers under the direction of the Navy Department or otherwise.

2. To aid in all proper ways the training of such owners and the necessary crews in all matters relating to preparatory development in the efficient use of such craft for coast defense.

3. To stimulate interest in such association, preparation and development by personal and united effort in all proper ways, generally throughout the United States, and particularly within the Third Naval District thereof.

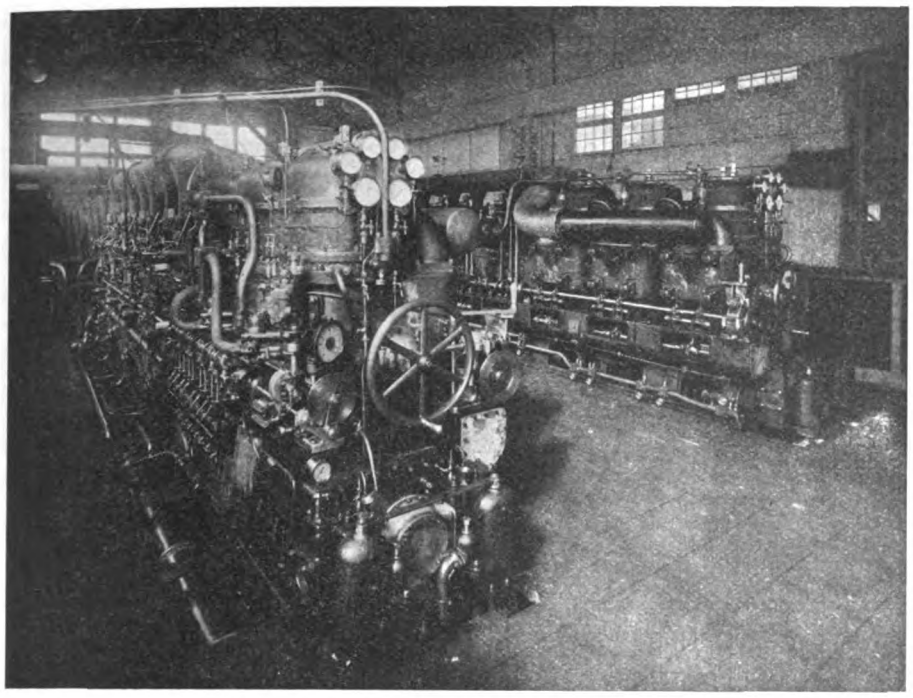
4. To unite with other associations with similar purposes in order to advance the general objects of this association.

PORTLAND SHIPS SOLD TO NORWEGIANS.

The Peninsula Shipbuilding company of Portland, Ore., F. C. Knapp, president, has sold the two auxiliary lumber schooners now under construction to Norwegian interests, negotiations being handled by the Donald Steamship company of New York. The price reported is $500,000, being the average of $250,000 for vessels of this type which can be classed at Lloyds or Bureau Veritas. No. 1 will be launched late in November, No. 2 about a month later. Keels will be laid for two more vessels similar in type.

SCHNEIDERS BUILD 12,000 H. P. SUBMARINES.

The announcement that Schneider & Co., of La Creusot, France, have offered to sell the U. S. Navy Department a license to construct their Laubeuf submarine has aroused considerable interest in the shipbuilding world. Their experience in submarine and submarine machinery construction work is so extensive that it is rather curious that some American shipbuilder has not previously secured their license and the advantages of their unusual knowledge on the subject. We doubt if any European concerns have built more submarines than have Schneiders—not even Vickers, Ltd., and it seems that they have completed larger sizes than any other builder. Our representative was informed by Messrs. Schneider that they have placed in service a submarine of 1700 tons displacement and driven by two 6,000 h. p. Diesel type oil engines. The illustration on this page is a twin-screw 2,200 h. h. p. set, consisting of two eight-cylinder two-cycle type reversible Diesel engines of Schneider design and construction, maneuvering being accomplished by operating a single hand-wheel. They were installed in the Imperial Japanese submarine D 1. If the U. S. Navy Department accepts their offer, Schneiders will net $68,000 for the first of class A, and $38,000 for each succeeding boat; $57,000 for the first of class B, and $23,000 for each following submarine, and $70,000 for the first of class C, and $40,000 for each after, and they guarantee that each of the class A built to their design will come within the limit of the $700,000 set by the department. In an early issue we intend publishing some details of the large and high powered submarines built and engined by this great French company.



12,000 H. P. ENGINES BUILT BY SCHNEIDER & CO.

SKANDIA COMPANY BUYS GORHAM ENGINE WORKS.

J. H. Hansen & Co., since securing the United States agency for the Skandia heavy-oil engine, have made remarkably rapid progress in providing for the wholesale manufacture of these engines on the Pacific Coast. After making temporary arrangements for the filling of certain rush orders, they have been seeking permanent manufacturing facilities adequate for their purpose; and their efforts in this direction have now resulted in the purchase outright, at a price of $100,000, of the shop of the Gorham Engineering company in Oakland.

The deal was carried out by a new corporation, which will handle the manufacturing of Skandia engines on the Pacific Coast, and is known as the Skandia-Pacific Oil Engine company. The company has a capital stock of $1,000,000, and the officers are: J. H. Hansen, president; Jafet Lindberg, vice-president; Guy Campbell, secretary and treasurer. The other directors are Wm. Metson and E. H. Hansen. Messrs. J. H. Hansen and Lindberg are already well known to users of internal-combustion engines on the coast; Mr. Campbell is associated with Mr. Lindberg in several of his enterprises; Mr. Metson is a member of the prominent law firm of Metson, Drew & McKenzie of San Francisco; and E. H. Hansen is a brother of J. H. Hansen, who is taking an active part in the business. The company's principal headquarters will remain for the present in the Balboa building, San Francisco.

The Gorham Engineering company's plant is located on the Tidal canal, Oakland, just east of the Park street bridge. Included in the deal is the one-acre site, with a good frontage on the canal. The Gorham plant at present consists of two buildings: the main machine shop, 70 by 200 feet, well built and very completely equipped with modern and accurate tools, including a 10-ton crane and several jib cranes, and a 50 by 150 foot building, in which are located a first-class brass foundry; a well-equipped woodworking plant, which has been used as a pattern shop and aeroplane factory; and a complete case-hardening and heat-treating furnace, suitable for handling very fine steel parts.

At the earliest possible moment the Skandia-Pacific company will begin the work of remodeling the plant for its purposes. An 80-foot extension will be added to the main shop on the side next the canal, bringing it almost down to the bulkhead line, and the crane runway will be extended, giving it a full length of 280 feet from the harbor belt railroad in front to the canal in the rear. A new 15-ton electric crane also will be added, besides some new large lathes and other special machinery for handling the large engines which will soon be built. The tools now on hand have been arranged along scientific lines, and for the most part will remain as they are; but the two buildings will be thrown into one, with a storage and tool room between, and much of the shop now used for aeroplane construction will be used for the erection of the smaller engines. The new addition to the large shop will be the erecting and testing plant for the larger engines, and will be very completely equipped for the tests required; while its position near the water will facilitate installation or shipment to coastwise points.

Mr. Hansen expects to have a capacity of six to eight of the large engines (240 and 350 h. p.) per month, when the improvements are completed, in addition to a number of the smaller models.

The Gorham Engineering company put up the shop in 1912, and has been a figure of some prominence in the gas engine business for a number of years. The company has specialized particularly on accurately-built, high-speed engines, and has lately developed a line of aeroplane engines of great promise. The equipment and manufacturing organization which are taken over by the new company are accordingly well adapted for the accurate work required for the satisfactory construction of Diesel-type engines.

The Gorham company does not go out of existence, its patents and designs forming no part of the present deal; but its plans for the immediate future are somewhat uncertain, as it is now without manufacturing facilities.

The Skandia-Pacific company has acted very quickly in the matter, as the deal was finally closed November 17, and the company took possession of the plant the same day, when some brass castings were made and a connecting rod and flywheel turned for the first of its new Skandia engines. The plant will be pressed into full use at once, for the erecting of the engines for which the heavier parts have already been completed in other shops, and the manufacture of other parts needed; and within a few weeks the plant will begin the manufacture of Skandia engines from start to finish.

The cylinder castings and crank-shaft forgings for the first engines have been completed in very satisfactory shape, the cylinder castings being tested after finishing to twice their regular working pressure. Three shops—the Union Machinery company, the Christie Machine works, and the Joshua Hendy Iron works—are now busy turning out crankshafts for the new engines, and the first pair turned out in San Francisco is now being assembled in the new shop.

A MOTOR WHALER

No doubt this illustration will be of particular interest to Pacific Coast shipowners, especially those engaged in the fishing industry, as it is of a Diesel-driven whaler. There were two of these vessels built about four years ago for the Antarctic whaling industry, namely the G. D. I. and the G. D. II., both of which were equipped with 200 B. H. P. Polar two-cycle type Diesel engines. Both of these little vessels remain in the Antarctic and are supplied by a large Diesel-driven auxiliary barque named the Sound-of-Jura, which also takes back the catch to the home port. The Sound-of-Jura was an old boat, and was engined about four years ago, but she has been a "Jonah" from her earliest days. On her first return voyage as an auxiliary her crew were stricken down with beri-beri.

Diesel Engine Construction in Philadelphia

A Visit to the Plant of the Southwark Foundry & Machinery Co.

How important the heavy-oil engine industry in America has become during the last year or two cannot fail to be impressed upon the mind of the visitor who is fortunate enough to be conducted through the machine and erecting shops at Philadelphia of the Southwark Foundry & Machine company, builders of the Southwark-Harris "valveless" Diesel-type oil engine, where dozens of sets ranging from 100 to 850 horsepower are in various stages of construction.

The first time that the writer saw the Southwark-Harris motor was a little over two years ago, when the original engine of this design was on the test-bed and the second was almost completed. During the interval of then and now three vessels, representing four engines, have been placed in service, and nearly a dozen additional sets have almost been completed. Hence it is easy for the writer to understand what fine headway has been made during the intermediate period. In one sense the writer has an interest in the production of these motors because he was the first engineering-journalist to see the two initial sets, and was privileged to write the first public description of the design and construction.

Except for minor details the present design of the Southwark-Harris engine is the same as the second engine built, which was installed in Mr. Vauclain's yacht "Southwark," and frequently used by the engine builders as a demonstration boat. The larger sizes, however, differ a little inasmuch as the automatic valve for admitting the scavenging-air from the step-piston chamber into the manifold that feeds the working-cylinder has been replaced with a mechanical rotary valve; also the design of the lower part of the step-piston has been altered to enable it to be used as a guide for the crosshead, as it has been found by the majority of Diesel engineers to make all large engines on the crosshead principle, especially marine models.

There are quite a number of excellent features in the Harris design—we say Harris design because Mr. Leonard Harris is the designer and also is consulting engineer to the Southwark Foundry & Marine company.—among these features may be mentioned the neat reversing mechanism, the presence of one opening in the cylinder head—that for the fuel-injection valve—which enables a simple design of cylinder head to be adopted, general accessibility, the fuel-pump governing device, and the excellent balance obtained with the firing, particularly with the six-cylinder model. Being of the two-cycle type there are six impulses per minute.

Another feature is that the lower, or step, pistons are used as pneumatic engines when maneuvering, and their large areas permit the use of fairly low pressure air, which means small air reservoirs in a vessel. We understand that in the shops starts have been made with about 95 pounds' pressure, but in general operation under service conditions round about 175-200 pounds is used.

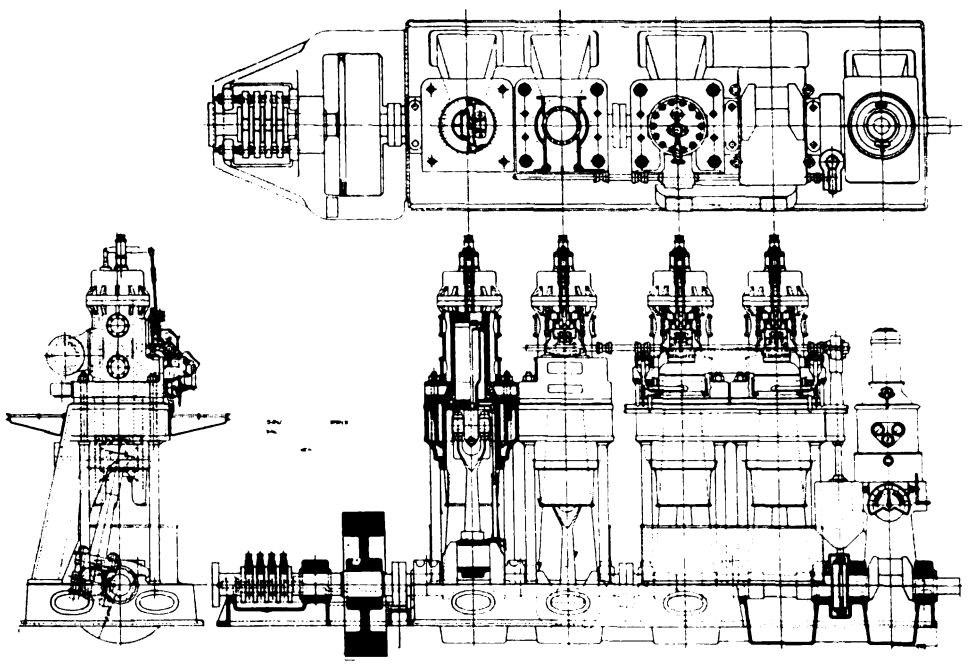
Various European Diesel engine builders have used the step-piston design, but so far as the writer can trace only one other used the lower piston for starting purposes. This was a Swedish company who have used it in large twin-screw vessels. With the engines of these ships it was found that low-pressuse air could be used for starting and reversing.

Drawings are given of the latest type Southwark-Harris marine model which makes an interesting comparison with the illustration of the first engine built, as it shows the vast strides that it is possible for a designer to make in about two years. The big four-cylinder engine is of 800 indicated horse power at 150 r. p. m. and weighs about 30 tons.

It will be noted that the cylinders are carried on a cast-iron frame, which is supported front and back by steel columns direct to the bed-plate, the studs that hold the cylinders passing down into the columns. By unscrewing the nuts the columns on the starboard side can be removed, allowing the crank-shaft to be taken out sideways without disturbing other parts of the engine. This means accessibility, and will be specially felt where the motor is installed in an engine-room of limited length, and where the bulkheads prevent the crank-shaft being drawn out endwise. Furthermore any bearings can be removed and replaced without taking out the crank-shaft. The main bearings are carried right between each set of steel columns, allowing the latter to absorb much of the tension strains given by the pistons. The crank-pit is covered by two detachable steel doors on the front, the cast-iron columns at the back acting as effective splash-guards.

At the forward part of the engine are the high and low-stage air-compressors, which charge the cold storage bottles with air at about 900 pounds per square inch for fuel injection purposes. On the outer casing of the low stage compressor are carried the various pressure gauges, right convenient for the engineer; also here is the single control wheel, by which the engine is started, stopped and reversed. On the front of the cylinders is the cam-shaft, off which the fuel-valves are actuated, and this shaft is operated by means of spur-gearing and an inclosed vertical shaft off the forward crank-shaft.

Very shortly a large number of these engines will be in service in mercantile vessels, such as the auxiliary for the Texas company and the tug for the Pennsylvania Railroad company. The operation of the twin-screw passenger vessel, "Palisades," is well known to all those who made a trip on her up the Hudson during her daily schedules last fall.



LATEST DESIGN OF SOUTHWARK-HARRIS MARINE ENGINE SHOWING ROTARY VALVE FOR SCAVENGING CONTROL

R. P. RITHET MAKES GOOD RECORD.

The Matson Navigation company's auxiliary barkentine R. P. Rithet, recently remodeled at the Union Iron Works, and equipped with a pair of 160 h. p. Bolinder engines, about the end of September completed her first round trip between San Francisco and the Hawaiian islands since the installation of the engines. According to officials of the Matson company, the engines have given a most satisfactory performance, especially in the time saved as compared with the vessel's former sailing performance.

On the way out, with more hindrance than help from the wind, she ran most of the time between 7½ and 8 knots; the trip from San Francisco to Port Allen, 2,167 miles, taking 12 days, 1 hour and 46 minutes. On the home trip, heavily loaded and drawing 18½ feet of water, the distance of 2,090 miles from Hana, Maui, to San Francisco, was made in 13 days, 17 hours, 40 minutes. Here also she had very little help from the wind; head seas being reported part of the time. With a good wind astern she made as much as 7.3 knots, and the lowest speed made on the home trip, against head winds, was 5.2 knots. The fuel consumption, measured from the San Francisco lightship to Port Allen and from Hana to the lightship, was a little less than 300 barrels. Formerly, under sail, her average time home from the islands was about 28 days.

THE DONALD STEAMSHIP CO. & AUXILIARY MOTORSHIPS.

It is not extensively known that the construction of many of the large oil-engined auxiliary ships now building on the Pacific Coast are in a great measure due to the activities of that well-known New York firm of shipowners and shipbrokers—the Donald Steamship Co., who are acting as brokers on the behalf of American and foreign interests. The number of large motor-driven auxiliaries now building to their order runs almost into the "twenties" (the first—the M. A. "Flagstaff" will be launched during December at Hanlon's shipyard), and of which over 50 per cent will be completed by next August.

Other boats to their order are building at Grays Harbor shipyard, the Olympia shipyard, the St. Helens shipyard, and by the Peninsular Shipbuilding Co. Additional vessels will shortly be laid down at these yards for them, and in more than one instance they have acquired the total output of the yards for the next two years.

In most cases Scandia surface-ignition type oil-engines will be installed, while in two boats domestic Diesel motors will be fitted. They have not yet gone so far as to order large full-powered ocean-going Diesel-driven steel ships, because of the long deliveries on both hulls and engines.

The two Diesel powered auxiliaries on order by them for foreign interests are the two four-masted schooners building by the Peninsular Shipbuilding Co. These vessels are each 250 ft. long O. A. by 220 ft. on the keel, with 43 moulded beam, and 21 ft. moulded depth, and 18 ft. 10 in. depth of hold.

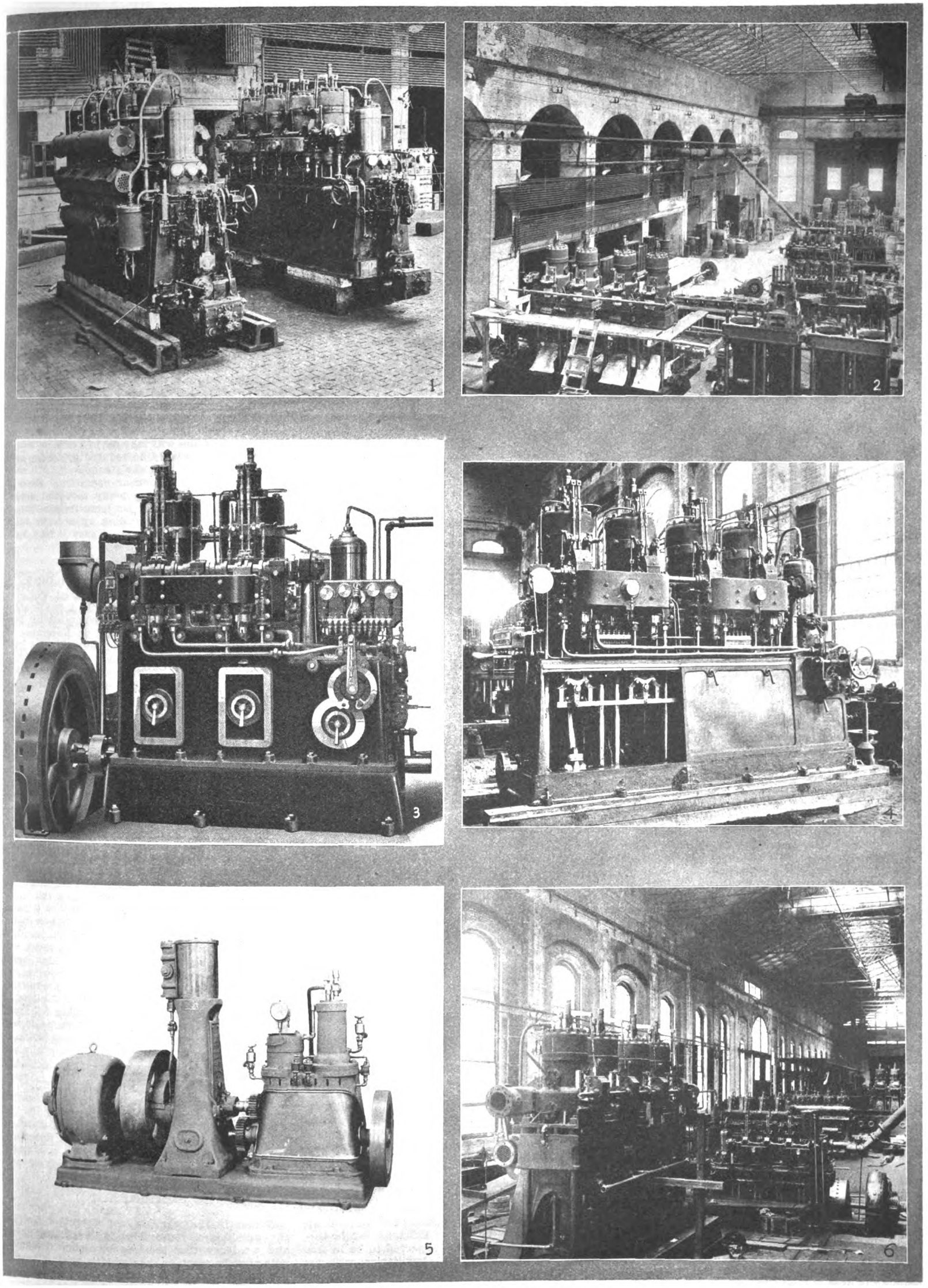
They are being built to Lloyd's 100 A 1 and will have a d. w. c. of 2,640 tons, or a capacity of 123,000 cubic feet. Lumber will be carried. The main propelling plant in each case will be a six-cylinder, 12 5/16 by 18 in. Winton-Diesel engine, developing a total of 600 b. h. p. or 950 i. h. p. at 200 r. p. m., and the vessels are expected to have a speed of 8 knots, the estimated fuel consumption being 25 barrels of oil fuel per 24-hour day, or about 3½ tons.

The boiler for the cargo winches, etc., will have a heating surface of 1,100 ft. with 19 ft. grate surface, and will work at 150 pounds pressure. In addition there will be a 6 ft. by 10 ft. donkey boiler, also working at 150 pounds pressure.

BOLINDER REPLACING STEAM ENGINE.

The Interisland Steam Navigation company of Honolulu is preparing to replace the old steam engine and boilers of its large passenger and freight steamer Mikahala with a single 320 h. p. Type M Bolinder engine, which is equivalent in power to a steam engine of 440 indicated horse-power.

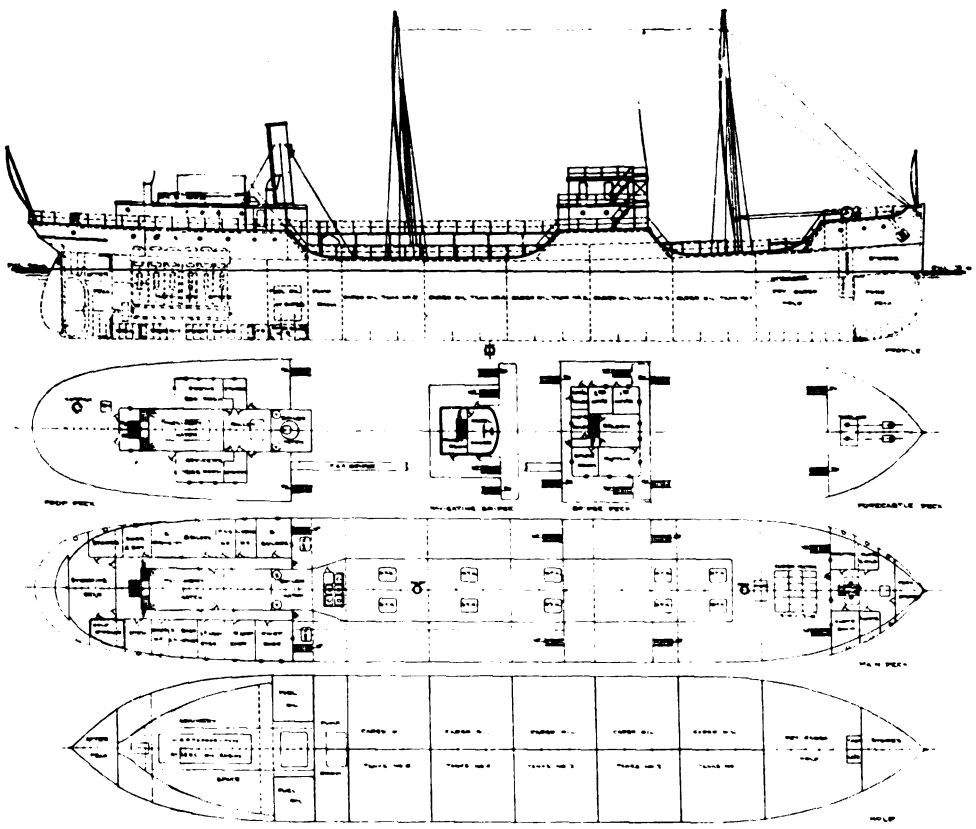
This is the first time a large vessel in the Pacific Coast district has discarded steam engines in favor of those of the oil-burning type, but there are already deals under way which show that there will be a great many more installations of the same kind in the near future.



VIEWS IN SOUTHWARK FOUNDRY & MACHINERY CO.'S PLANT

1.—Pair engines for passenger vessel built by Mathis Ship Building Co. 2.—Partial view of Erecting Shop showing Diesel Engines under construction. 3.—First Southwark-Harris Diesel-type Engine ever built. 4.—Oil Engine built for W. J. Coxe for installation in yacht "Georgianna III." 5.—Auxiliary Engine Compressor and Generator for 12 x21 Oil Engine "Fatius River." 6.—One side of erecting machine shop showing Diesel Engines under construction.

Diesel-Driven Tanker for Prominent American Oil Company



ELEVATION AND DECK PLANS OF DIESEL DRIVEN TANKER FOR AMERICAN OIL CO.

About a year ago three of the most important shipbuilding companies in the United States, having recognized that the large mercantile motorship had come to stay, laid plans for the immediate and near future by obtaining constructional licenses from prominent European firms who had obtained practical success with high-powered marine Diesel-type oil engines.

Although Germany is the original home of the Diesel engine, they did not go to that country for their designs, but to Denmark and Holland, where greater strides have been made with the marine development—German engine-makers having paid more attention to the stationary motor and to the naval-type installations. One firm acquired the Danish license and two the Dutch design.

No sooner had these firms concluded negotiations they were overwhelmed with orders for steamships and their plans for building motorships were somewhat hampered. But before long we can expect important developments in the yards of all three firms—we refer to the William Cramp Ship & Engine Building Co. (Burmeister & Wain license), the New York Shipbuilding Co. (Werkspoor license), and the Newport News Shipbuilding & Dry Dock Co. (Werkspoor license.)

More information we are not allowed to divulge just now, but when operations commence it means that other steel shipbuilding companies of similar importance will be obliged to turn their attention to Diesel engine and motorship construction. Having regard to this we learn on fairly good authority that the various large shipbuilding yards controlled by Bethlehem Steel interests will not be lagging in this respect when the present pressure of steam work eases off.

Foreign licenses, we believe, will not be handled, as much is expected from a design, or designs, of a Diesel engine, now being developed at one, or more, of the works, under the supervision of engineers of the Bethlehem Steel corporation. In a measure this step is somewhat unexpected, because, so far as we have been able to ascertain, the leading engineers of many of their branches are more in favor of adopting some proven foreign design. Of course, it is possible that developments with their own engine may have caused a change of opinion. Following their usual policy the Bethlehem folk have not divulged much as to their intentions, but have maintained a discreet silence. We should like to see them follow the policy that Harland & Wolff have just adopted, and that is, to produce a standardized motorship in large numbers. This probably would "force" the unattached shipyards to lay their plans for the near future for the building of motorships—and to do so without delay; particularly as when the existing rush of building is over few steamships of under 10,000 tons displacement will be laid down—the majority of orders placed will be for motorships. Several important shipowners have advised us that many of the ships now under construction would have been Diesel-driven had it not been for the quick delivery question. Dozens of shipowners are willing to build full-powered motor vessels, but are not receiving much encouragement or co-operation from domestic shipbuilders.

In view of the various foregoing remarks the following details (exclusive to Motorship) of a Diesel motorship that has been designed by the New York Shipbuilding company of Camden, N. J., will be of considerable interest. This vessel, which is a tanker, was designed to the order of an important American oil company, and were it not for the extraordinary active conditions that now reign at Camden, as well as the unsettled labor conditions in the builder's yard, she would have been laid down at least four months ago, the owners being perfectly willing to go ahead, as were the builders.

She is a single-screw ship, designed to carry oil in bulk, and is of the single-deck class with poop-bridge and forecastle. Her dimensions are as follows:

Length overall	260 feet
Length, b. p.	250 feet
Breadth	42½ feet
Moulded depth	23 feet
Draught	20 feet
Displacement (summer)	4,625 tons
Dead weight capacity	3,000 tons
Cargo capacity of holds	2,875 tons
Indicated horsepower	1,360 h. p.
Engines	Four-cycle Diesel-type
Speed (loaded)	10 knots

The engine is to be a six-cylinder single-acting, four-cycle model of the Werkspoor pure-Diesel design, to be built by the New York Shipbuilding company themselves under license. Each cylinder will have a bore of 22 inches by 39⅜ inch stroke, and a total of 1,360 i. h. p. or 1,020 b. h. p. will be developed at 125 r. p. m., the mean effective pressure being about 100 pounds per square inch. This i. h. p. is equivalent to about 1,200 steam i. h. p. The length of the engine overall will be 27 feet 3 inches by 16 feet 9 inches height above shaftcenter, and it will follow the marine steam-engine practice with short pistons (sea water cooled), crossheads and guides, the latter being mounted on cast-iron columns, while the cylinders will be carried on perpendicular forged steel columns and diagonal steel columns. The net weight of the engine will be about 122 tons, while the total machinery weights are expected to be in the neighborhood of 220 tons. Auxiliaries will be steam driven, and probably the exhaust gases from the main engine will partially be used for firing the donkey-boiler and thus economize in fuel.

A space of 45 feet has been given over to the engineroom and donkey boiler, thus affording greater space for the cargo than a steamer could have, as the latter's engine and boiler rooms would require 57 feet of the length. Considerable additional space is gained by reason of the fuel-bunkers being only of 100 tons capacity, which will give the ship a radius of 4,000 sea miles, or about 17 days running with 15 tons to spare. Including auxiliaries the fuel consumption is 5 tons per 24-hour day, which is very low indeed for a ship carrying 2,875 tons of oil cargo in her holds at 10 knots average. On trials 10½ knots is expected. A further gain is made by the small quantity of fresh water needed, this water, stores and crew weighing 35 tons, approximately.

The engine room staff will consist of seven men, viz: chief, first, second and third engineers, three oilers, and a pump man. About 20 gallons per day of lubricating oil will be used.

It will be realized that an oil-fired, or coal-burning, steamer of the same dimensions and speed would not carry anything near this amount of cargo (2,875 tons), hence not only will this Diesel ship have much greater earning powers, but her fuel bill will be about one-fourth, her tonnage dues will be less in proportion to the cargo, and there will be no wages or food bill for stokers. Her oil fuel bill for a 17-day voyage will be under $1,000—this with oil at $1.50 per barrel, but as she will take oil in Texas or Mexico this cost will actually be reduced by 50 per cent. Hence, compared with the steamer she will show extraordinarilly economical operation. Even in normal times will mean many thousand dollars per annum. The writer conservatively estimates $35,000 per annum, depending upon cargo rates, and the number of voyages. Today it may mean double this amount.

OAKLAND TO TEACH SHIPBUILDING.

The high schools of Oakland, Cal., will soon offer a course in shipbuilding and naval architecture, a resolution to that effect having been passed by the Board of Education November 13. The board authorized the appointment of a committee to be chosen from among the Oakland shipbuilders, to decide upon a system of instruction, thus assuring that the course will be developed along practical lines.

UNION GAS ENGINE HEADQUARTERS MOVED.

The principal place of business of the Union Gas Engine company, which has been for some time at 24 California street, was changed November 1 to the plant, at the foot of Kennedy street, East Oakland, where suitable offices have been fitted up for the executive and sales departments.

THE AVARUA SAILS.

The auxiliary schooner Avarua, powered with an 80 h. p. Union engine, left port November 12 on her maiden voyage to Guam with a full cargo of general merchandise, in command of Captain Louis Ward. On reaching Guam, Captain Ward will return, leaving the command to his first mate, Captain W. J. Woodside. The Avarua will be used among the islands, for collecting copra and other produce. She was built to plans by Frank Stone, at the shop of William S. Brusstar, Jr. She made a highly successful trial trip around the bay on the morning of November 9. From a distance she looks like a yacht, owing to her fine lines, but she is of quite business-like construction.

CALLAO POWER BOAT LAUNCHED.

The auxiliary schooner Nuova Italia (erroneously mentioned before as Premiere Italia) for the Angelo Fasce company of Callao, was launched November 11 from the yard of Schultz, Robertson & Schultz, San Francisco. Her 125 h. p. Skandia engine is now being installed, after which she will leave immediately for the west coast.

Evidently the war has not altogether stopped the building of motorships in the British Isles, and we learn that the new motorship Glenamoy will shortly start on her maiden voyage, having been built and engined on the Clyde for the Glen Line. We previously have referred to the great steps now being taken by Harland & Wolff to construct standardized motorships.

The Motorship "Hamlet"

The Highest-Powered Diesel-Engined Merchant Vessel

The motorship "Hamlet," is equipped with two-cycle Diesel engines totalling 4,700 i. h. p. She is thus the highest-powered oil-engined mercantile ship afloat, and as the engines are of the two-cycle type her performance is of the utmost importance to all concerned with the development of the motor vessel.

The "Hamlet" is a tank vessel ordered originally by Nobel Bros., of Petrograd, under the name of "Varjag," but sold before completion to Norwegian owners, Messrs. Bruusgaard Kjösterud, of Drammen, for service between Europe and America. She is 368 ft. (355' b. p.) in length, with a beam of 53 ft. and a depth of 29 ft. 9 ins., having a d. w. capacity of 6,800 tons, a displacement of 10,060 tons, and a gross tonnage of 5,093. The builders of the hull were the Goteborgs Nya Verksted, of Gothenburg, who at the present time are building several other large motor ships. The machinery was contracted for by the Aktiebolaget Diesels Motorer, of Stockholm (Polar Co.). Before describing the engines it should be mentioned that apart from a four days' trial at full power in the shops no trial run was made, the vessel proceeding on completion to Vallo, from Gothenburg, thence to Kirkwall and across to New York at an average speed of 11½ knots, which is probably the highest speed at which any motor vessel has crossed the Atlantic. This was a non-stop run. Avonmouth was reached in the return journey on 13th October.

The engines are of quite a new type for the Polar Co., the arrangement of scavenging pumps beneath the working cylinders having been modified, although the very important feature of port scavenging is retained. The two motors are each rated at 1,650 b. h. p. at 120 r. p. m., or about 2,300 i. h. p., and at this power the vessel attains a speed of 12 to 12½ knots. The cylinders have a diameter of 600 mm. (23⅝ ins.), whilst the stroke is 900 mm. or 35 7/16 ins., and in general the engines embody most of the main features of design that have been adopted by the Polar Co. for so many years, except in the matter of scavenging arrangements. The following analysis of recently-built high-powered Diesel engines gives an idea of the proportions favored by designers for marine work.

Type of Engine	Four- or two-cycle	B. H. P.	No. of cylinders	R. P. M.	Bore	Stroke	Piston Speed Metres
					mm.	mm.	Sec.
Carels	2	1800	6	100	600	1100	3.67
Krupp	2	2000	6	90	625	1200	3.6
Burmeister and Wain.	4	1650	6	100	740	1100	3.67
F. I. A. T.....	2	2200	6	130	630	900	3.9
Polar	2	1650	6	120	600	900	3.6

The remarkable unanimity of all the manufacturers in the matter of piston speed is well worth noting, for it is piston speed that is one of the chief limiting features in the increase in size in Diesel motors. It has been found that a speed of 3.6 metres per second is the most suitable for Diesel engines designed as slow-speed machines, but in submarine motors the figure is considerably exceeded.

From the dimensions given and by noting the comparative size it will be gathered that the 1,650 b. h. p. of the engines under description is a conservative rating, and there is little doubt that much higher power (up to about 1,850 h. p.) could be developed if necessary.

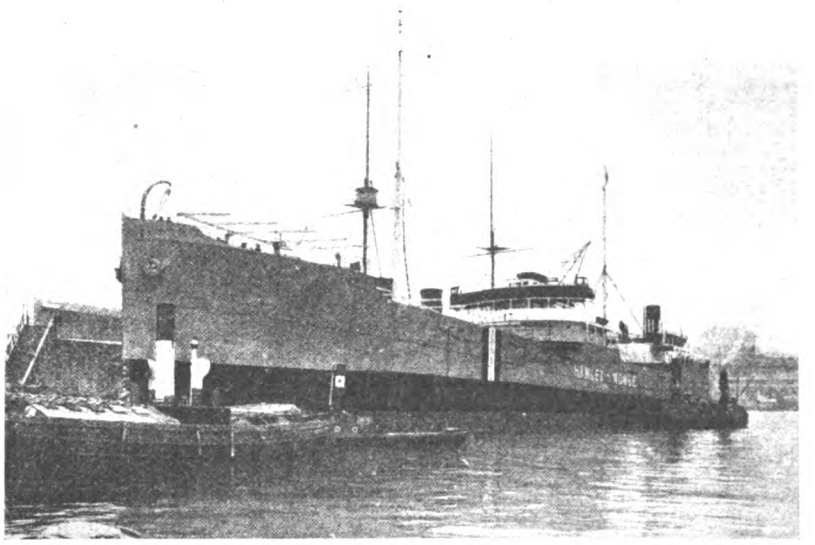
The "Hamlet" is the largest tank vessel constructed in Sweden, and is, in fact, one of the biggest, if not the biggest, ships of any type built in that country. There are 12 tanks for the oil fuel, six being amidships (longitudinal), and three on each side. The tanks for the main engines are on the port and starboard side of the engine-room at the after-end, and have a total capacity of about 850 tons, which, in case of necessity, would be sufficient for a voyage of about 90 days (or 25,000 nautical miles), the daily consumption at 11½ knots being about nine tons.

The consumption of nine tons per day must have been with a lower average speed than 11½ knots and a lower power than 2,500 h. p. The consumption of nine tons per day is equivalent to 2,000 b. h. p. and a speed of probably 10¾ knots. It is possible, however, that the speed of 12½ knots is exceeded with a total power of 3,300 b.h. p.—Ed.

The ballast tanks are aft of the engine-room, whilst there is also a peak tank. There are double pipe lines for each oil tank, one on each side, these being duplicates, so that in case of breakdown of one pipe line the other may be used. In the ordinary way, however, both pipe lines can be employed in case it is required to load or discharge the tanks rapidly.

The pump room is approximately amidships, and in it are installed two large steam-driven centrifugal pumps of a capacity of 250 tons of oil fuel per hour each, so that the whole load can be taken on or discharged in about 14 hours. The other steam-driven machinery comprises steam capstans and also the steering gear, and in order to provide sufficient steam for these machines there are two donkey boilers, one large and one small. When at sea, only the small donkey boiler is in operation, since the steam is only required for the steam steering gear and for heating. In port, the larger donkey boiler is used, this being sufficient to provide for the centrifugal pumps, winches and other auxiliaries.

The "Hamlet," which is equipped with wireless telegraphy, is considered in Sweden to be one of the best-equipped vessels of her type, and the quarters for the officers and crew are very comfortable. The officers' cabins are below the bridge, whilst the crew are located forward, the engineers having their accommodation around the top of the engine-room. In addition to the auxiliary mentioned there is a refrigerating plant for the provisions for the crew, whilst there are the usual distillers, and specially good ventilation is provided both in the cabins and also (more important) in the tanks.



MOTORSHIP "HAMLET"

It has always been a feature of the Polar engines to have as many of the necessary auxiliaries —that is to say, auxiliaries in use when the main motors are running—driven direct off the main engine, and this policy has been carried out in the engine under description. Scavenging pumps and the injection pumps are driven by means of balance levers from the main engine crosshead. In this way not only are the air compressors operated, but also the cooling water pump for the cylinders and pistons, as well as the fuel oil and lubricating pumps. It may be added that the pistons can be cooled either by salt water or by fresh water at will.

The other auxiliaries in the engine-room, which are not operated directly from the main engine, comprise two large air compressors, driven by means of Diesel engines. There are also two dynamos, one of which is steam-driven for use when the boat is in port, and the other driven by a high-speed Polar-Diesel engine of the type which has been described in this journal. It is of the four-cycle design running at 550 r. p. m., and eminently adapted for driving a dynamo, since the high speed in this case is a distinct advantage. Apart from these two dynamos there is a third, which is driven directly off the main engine.

Fuel oil is pumped up from the main tanks in the engine-room to the supply tanks by pump on the main engine, and it is delivered to the fuel pump of the engine after passing through filters and other separating devices. Filters are also employed for filtering the lubricating oil and separating any water.

One of the most interesting points about the engine-room as a whole is the fact, that the control station is at the level of the top grating and not at the engine-room floor level, as has been the case in practically every previous motor ship built, and in every steamship, we imagine, that has been put into service. It might seem that this alteration had been carried out merely for the sake of novelty, but when one analyses the matter it must be admitted that the most important parts of a Diesel engine are above the top grating, where most of the lubricating arrangements are located. Also, the fuel injection valves, the camshafts and levers for their operation, and the greater part of the control are situated there. There is, obviously, much to be said for the top of the engine-room control, particularly as it is much more cheerful for the engineers in charge, but we have no doubt that there will be much objection to this innovation, which will not meet with the approval of all marine engineers or engine builders.

The scavenging air is provided both by the scavenging pumps which are driven by the beam levers and also by scavenging pumps below the working cylinders. These latter are also employed for starting the engine, so that compressed air is not admitted into the working cylinder for this purpose. Obviously, this arrangement presents a great advantage, since the admission of highly-compressed air, which expands and cools the working cylinder just before the first ignition, is highly undesirable and gives rise to exceedingly large stresses that are apt to be lost sight of by manufacturers. There is no doubt that a large proportion of the trouble due to cracks, etc., in Diesel engine cylinders and covers is accounted for by this variation of the temperature just at the period of starting up.

For starting the engines in the "Hamlet" compressed air is admitted to the scavenging pumps below the working cylinders, and even this is at a relatively low pressure of something under 100 lb. per square inch. In the ordinary way the air is drawn into the scavenging pumps from the atmosphere through special silencers and sleeve valves. When it is required to start up, the admission of this atmospheric air is shut off and the same movement opens the pipe connection between the compressed air reservoirs and the working side of the scavenging pumps.

Immediately the engine has run up and ignition has commenced, the lever which carries out this movement is placed back in its original position and atmospheric air is drawn in the scavenging pumps, which continue in the normal course of operation.

The reversing wheel actuates the cam-shaft and moves it longitudinally so that the astern cam comes underneath the roller at the bottom of the lever actuating the fuel inlet valve. There is no further valve in the cylinder cover,

so that the method of reversal is, of course, simplified in this way. The lever seen on the right of the reversing wheel actuates the sleeve valves for the air and allows the motor to start up. The smaller wheel seen on the right is for controlling the speed of the engine by acting upon the fuel pump. This control is carried out in the ordinary way. It will be noticed that the camshaft is wholly enclosed.

It will be seen from the illustration that the "Hamlet" is provided with a funnel at the after-end, and the exhaust gases from the engines are discharged up this funnel, besides which it acts as the uptake from the auxiliary boiler. The exhaust from the auxiliary machine also passes up through the funnel.

The engines of the "Hamlet" drive propellers having a diameter of 4,500 millimetres.—English Motorship.

A GREAT-LAKE MOTORSHIP.

Long before motorships were operating on the high seas there were numbers of large Diesel-driven vessels in service on Russia's great lake, namely the Caspian Sea, and on the river Volga. These vessels whilst efficient in operation were quite different from the sea-going motorship as we know it today, and their engines were more, or less, stationary motors of fairly high speed, altered to suit marine conditions. Some of the ships employed various ingenious schemes for reversing, such as electrical transmission, and slipping clutches with gear mechanism, while later engines were made reversible. What has happened since the war is not known in America, but previous to 1914 the motors of the ships in service had not developed to the present extreme marine type and so retained the enclosed crank-chamber, trunk-pistons, and were without cross-heads and guides. Hence, it is that these vessels, whilst of unusual interest are hardly regarded as "sea-going" motorships, particularly as they were inland water craft.

The vessel illustrated is the "K. W. Hagelin," one of the two sister-ships placed in service in 1909-1910 by Nobel Brothers, Naphtha Production Co., of Petrograd, Russia. She has a loaded capacity of 4,821 tons of oil cargo, and is 380 feet long by 46 feet beam, with a moulded depth of 25 feet, and 16½ feet draft. Her total propelling power is 1,200 shaft-horse-power, this machinery consisting of two reversible six-cylinder Kolomnaer-Diesel oil-engines each of 600 b. h. p. It will be noticed from the illustration that there is a lot of ice around this boat, which calls to mind the fact that these vessels are worked night and day for about six months in the year, so that practically no time is afforded for repairs, and any mishaps that occur during operation are temporarily patched up until the ships are laid up for the winter, so that during the months they are in operation, the Diesel engines are subjected to exceptionally severe work.

THE DIESEL-DRIVEN MOTOR TANKER "K. W. HAGELIN"

She is one of the pioneers of the present movement, having been working for over six years

HARLAND & WOLF TO BUILD DIESELS.

It is reported that Messrs. Harland & Wolf of Belfast, the well-known shipbuilders who constructed the "Olympic" and the "Titanic," are about to take an active part in motor construction and on a very large scale. Up to now the Burmeister & Wain Oil Engine company of Glasgow, with whom they are associated, have constructed all the engines for the hulls built by Harland & Wolf, so we presume that the Glasgow company will still continue to build the machinery.

MOTOR POWER FOR SALMON SHIPS.

While it has never been feasible to use steam power in the Alaska salmon vessels, except in a small way for special purposes, the recent progress made in the manufacture of internal-combustion engines combining high efficiency with low fuel cost, economy of space and simplicity of operation has caused the question of auxiliary power to become an important issue with the Pacific Coast salmon canning companies, and new developments in this line are being closely watched. A recent newspaper report to the effect that all the steel vessels of the Alaska Packers' Association were to be given auxiliary power was decidedly premature, as far as any definite plan is concerned, but it is admitted that such action is likely to be taken with regard to a number of the ships as soon as the engines reach a sufficient degree of perfection.

The advantages of auxiliary power in the sailing ships of the salmon fleet are fully recognized by all the packers; a vessel would be able to make several trips to Alaska during the season, instead of one, thus reducing the number of vessels needed to conduct packing operations on the present scale, especially with the larger companies; the vessels could safely be dispatched on long voyages during the winter season, when under present conditions most of them have to be tied up, which under favorable conditions would make the ships an important source of revenue instead of an expense, and it is quite possible that some of the cannery vessels could be used for the transportation of the pack through the Panama Canal to Atlantic ports, if not to Europe. Under any conditions it would overcome many difficulties which have hampered the industry and restricted its profits in the past. The only problem is to find a type of engine that does not involve disadvantages equal to its advantages, and the packers are becoming convinced that the solution of this problem is near at hand. Which type of engine will finally prevail is still uncertain, some being disposed to favor the latest developments of the true Diesel engine, and others the "semi-Diesel" or hot-bulb type.

Officials of the Alaska Packers' Association state that they are not yet ready to install engines in their vessels, feeling that the Diesel engine has not reached a degree of demonstrated perfection that would warrant such action, but they are closely watching the performance of some of the engines now being installed in vessels similar to theirs.

A serious difficulty in the way of power equipment for salmon ships is the necessity of having a special engine-room crew, which could be depended on for no other work, and would of necessity be idle much of the time, making a large item of expense.

FISH BOAT "SEMI-DIESEL" EQUIPPED WITH JACOBSON SURFACEIGNITION OIL ENGINE

An interesting installation, the first of its kind on Puget Sound, is the Jacobson Semi-Diesel oil engine installed in the above vessel, being a single cylinder two-cycle 7 by 7½, developing 10 b. h. p. at 425 r. p. m. The engine is extremely simple, of the surfaceignition type, is possible to start with hot torch and kerosine within three minutes, whereas on calol it takes about 10 minutes to generate heat sufficient for heavy oil ignition with good combustion. The oil injection is controlled by a governor built into the flywheel, and in operation it is stated that the engine will govern as low as 75 r. p. m.

Air compression is said to be about 170 lbs., with fuel injection at about 200 lbs.

From Tacoma to Seattle, running at 300 r. p. m. for 4 hours, the total consumption did not exceed 2½ gallons of calol fuel oil.

The hull in which this engine is installed is a combination trolling and halibut boat owned by A. Strubstad of Tacoma. The Jacobson oil engine was supplied by the Nelson Semi-Diesel Agency, 82 West Marion St., Seattle.

ANDY MAHONY'S MOTORSHIP PLANS.

Andrew F. Mahony, the "retired" San Francisco shipping and lumber magnate whom the present shipping situation has brought back into the game stronger than ever, is making further additions to the fleet of vessels he is building at James Robinson's shipyards at Benicia. The vessels are all designed by Mr. Robinson. Two of them are now under construction, and the first, Mr. Mahony says, will probably be launched in January, the second about 60 days later. A third of the same type will be started by Mr. Robinson as soon as these are completed, and plans are now under way for a shallow-draft vessel of entirely different design.

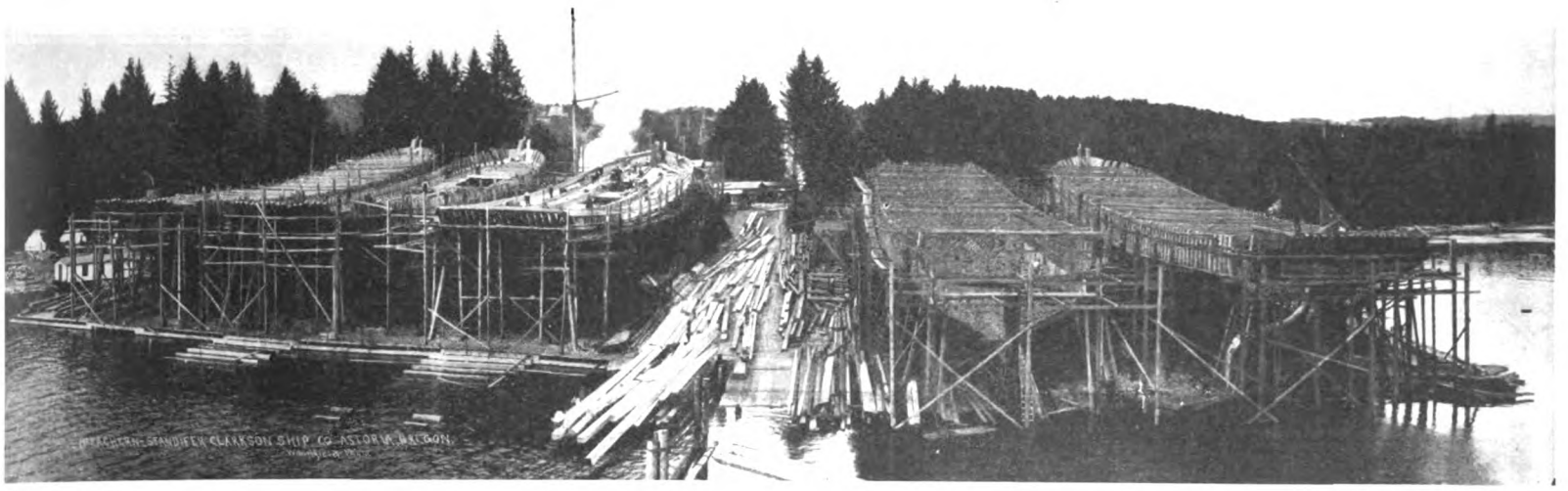
The first three are four-masted, auxiliary schooners, powered with twin 160 h. p. Bolinder engines. They are 217½ feet between perpendiculars, 43 feet in beam, with a moulded depth of 20 feet 3 inches. They are built with 'tween decks, and can be used for either lumber or merchandise; and the construction is exceptionally heavy, probably heavier than anything built in the past on the coast. Six-inch planking is used over the bilges, with 12-inch ceiling inside, all very firmly fastened; and over the keelsons, clear up to the lower deck, is a solid bulkhead from stem to stern of 18 by 18 inch timbers, all very strongly fastened through the keel.

Mr. Mahony is placing no reliance on electricity for auxiliary equipment, but is putting in sunken head steam engines of the usual type used on lumber schooners, operating 75 h. p. cargo hoists at the two hatches.

The shallow-draft boat has not yet been fully planned, but she will be entirely a motor vessel with no provision for sail power, and is intended to work in such harbors as Coquille river, etc., where there is little depth of water. The general dimensions will probably be about 180 feet long, 14 feet beam and 13 feet draft, with capacity for some 600,000 feet of lumber, and the power will be twin 240 h. p. Bolinder engines.

NEW TOWBOAT FOR OAKLAND.

H. Anderson of San Francisco has about completed a new 40 by 12 feet tow boat for Oakland parties. She will be powered with a 30 h. p. S. F. Standard engine.



McEACHERN-STANDIFER-CLARKSON SHIP YARD, ASTORIA, ORE. "THE CITY OF ASTORIA," LAUNCHED OCT. 28th, IS THE THIRD VESSEL FROM LEFT

LAUNCH OF THE "CITY OF ASTORIA."

The first of the five wooden vessels being built side by side at the McEachern-Standifer-Clarkson Yard at Astoria, Ore., was launched Oct. 28th and christened "City of Astoria" by Miss Gertrude McEachern, daughter of J. A. McEachern, the senior partner and superintendent.

She is 250 feet in length, beam 43 feet and depth of hold 21½ feet; five masted fore and aft auxiliary schooner, her power consisting of twin 240 b. h. p. Skandia oil engines.

Since her launching the "City of Astoria" has been purchased together with the four vessels in course of completion by the A. O. Anderson company, which company has also placed a further order with the McEachern yard for three more auxiliary schooners similar in type.

TACOMA SHIP BUILDING YARD SIGNS CONTRACT.

Announcement of the placing of a contract with the Seaborn Shipbuilding Co. of Tacoma was made Nov. 22 by Captain Hans Chr. Hansen, a shipowner of Porsgrund, Norway.

She will be a wooden auxiliary schooner 266 feet over all, 43 feet beam and 22 feet depth of hold. The power will consist of a twin set of 240 b. h. p. Skandia Semi-Diesels. Captain Hansen announces that he has an option on a second and similar vessel by the same yard.

DIESEL FERRY SUCCESSFULLY OPERATING.

The King County ferry "Vashon," equipped with the first Atlas Diesel, is now in daily operation between Vashon island and Des Moines.

CORRECTION.

Judge A. L. Flewelling of Spokane was erroneously mentioned in the daily press as an official of the American Shipbuilding Co. Judge Flewelling informs us that he is in no way connected with the above concern.

LAUNCH OF M. S. "SANTINO."

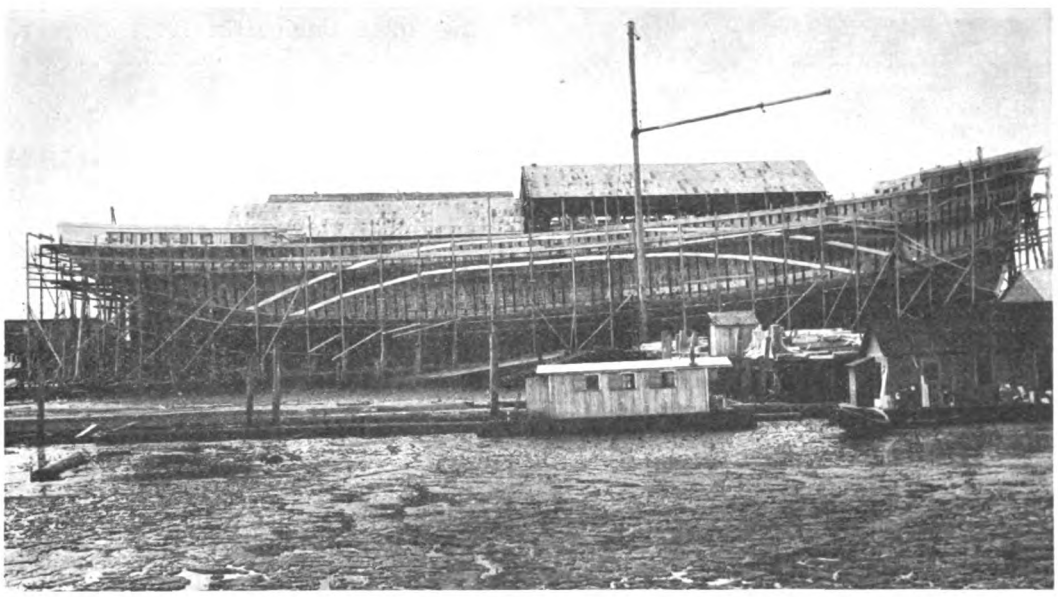
The Grays Harbor Shipbuilding Co., of Aberdeen, Wash., launched their first vessel Nov. 26, which was christened "Santino" by Miss Dorothy Schubach, daughter of A. Schubach, founder and director of the above company.

"Santino" (described and illustrated in our November issue) is the largest five-masted auxiliary lumber schooner yet constructed on the Pacific Coast, being 290 feet in length with a capacity of 2,000,000 feet of lumber b. m.

The auxiliary power will consist of a twin set of 350 b. h. p. four-cylinder two-cycle Sumner oil engines now being completed by the Puget Sound Iron & Steel Works, Tacoma, Wash. "Santino" is owned by Swayne & Hoyt, of San Francisco.

SEATTLE DESIGNED OIL ENGINE.

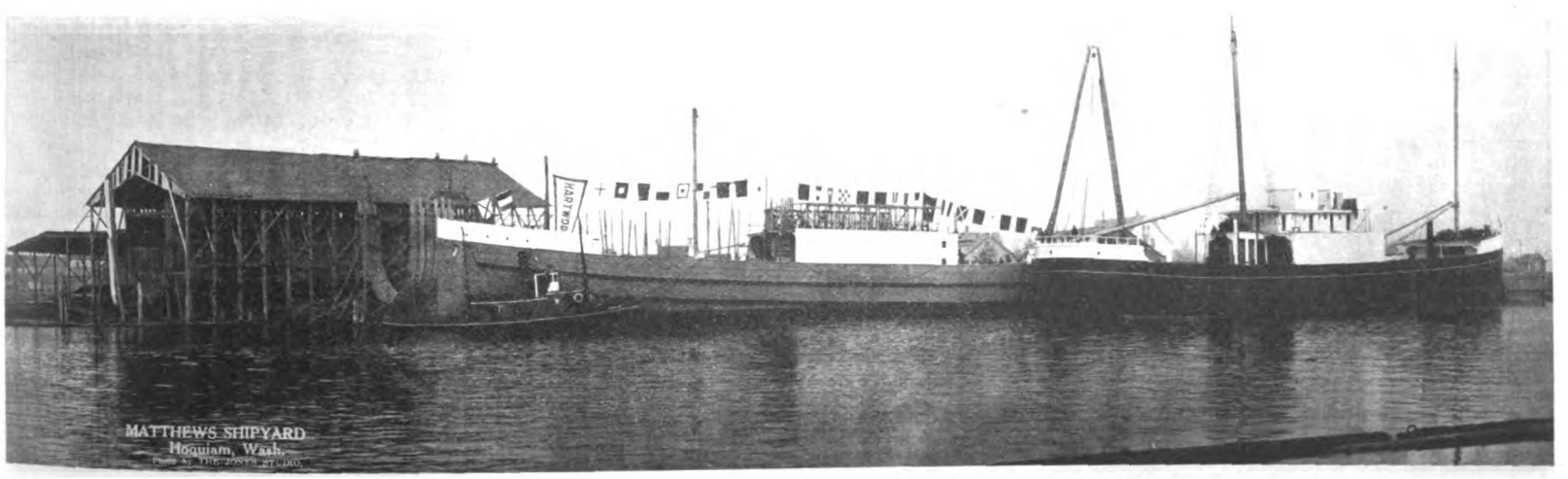
John F. Schneider, a well-known gas engineer of Seattle, has designed a marine oil engine for commercial use. The first drawings are for a single cylinder 10 b. h. p. four-cycle engine of the hot bulb type, embodying novel features. These engines will be Seattle manufactured.



"SANTINO," UNDER CONSTRUCTION BY GRAYS HARBOR SHIPBUILDING CO., ABERDEEN. NOTE ARCH STEEL TRUSSING

SATISFACTORY TRIAL TRIP OF M. S. "SIERRA."

The motorship "Sierra," recently launched from the Mathews Ship Yard, Hoquiam, Wash., and owned by the E. K. Wood Co, Ltd., was given an extensive trial Nov. 22d. With her twin 320 b. h. p. Bolinders running easy the vessel developed a speed of 9.9 knots.



MATHEWS SHIP YARD, HOQUIAM, WASH., SHOWING M. S. "SIERRA" AND "HARTWOOD," RECENTLY LAUNCHED

WHY M. S. "CITY OF PORTLAND" HAD FOUR ENGINEERS.

November 2, 1916.

To the Editor of Motorship:

Dear Sir—In reply to your enquiry re engine room crew of "City of Portland." The inspectors insisted upon having two men on watch in any event, one engineer and one oiler, which would require three engineers and three oilers to comply with their requirements for 8-hour watches. The union demanded, in accordance with their agreement signed up June 1st by the shipowners of the Pacific Coast Association, that any vessel over 1,000 tons should carry, when engaged in off shore business, a chief engineer and three assistants. Therefore, the "City of Portland" is equipped with four engineers and three oilers.

In the opinion of the company's officials, it was thought advisable to take no chances in the operation of the plant on such a long voyage, the entire trip involving some 16,000 miles. This type of vessel is comparatively an untried experiment on this coast and in view of the results obtained up to the present writing the McCormick officials feel fully justified in manning their engine room with four engineers. It is generally believed that as these auxiliary motor vessels become more commonly used on the Pacific Coast, which will provide for a greater number of efficient engineers, that these vessels will be manned with the minimum number of engineers and oilers, but in any event, in off shore voyages, the engine crew will consist of two men on watch where plants having twin screws are installed.

In the matter of deck equipment, with the number of men employed, eight shipped as sailors, two of which were known to be experienced winchmen such as are used on the coast wise vessels. This number is not too many for the handling of the sails as was demonstrated on the voyage of the vessel down the coast. It was understood that these men operate the winches while in foreign ports in order that the best possible dispatch might be obtained by men who are entirely familiar with deck machinery. It is well known and generally conceded that the methods obtained in handling lumber on the Pacific Coast are a great deal faster than the systems in use on the Atlantic and in foreign ports. These particulars are intended to eliminate any mistaken idea that might be in circulation regarding the "City of Portland's" crew.

L. M. PERKINS, St. Helens, Ore.

LLOYD'S REGISTER OF SHIPPING AND MOTORSHIPS.

We have received a copy of the report of the operations during 1915-1916 of Lloyd's Register of Shipping from which we extract several items of interest to the motorshipping industry. A number of shipowners seem convinced that geared steam-turbines will be a strong competitor of the Diesel drive; but in actual practice there can be no comparison from an economical point of view. Nine geared-turbine vessels were built during the year. Fifty-two geared turbine ships are in course of construction. The following are the Society's remarks regarding large Diesel-driven motorships:

"There are now 46 vessels holding the Society's classification which are fitted with engines of the Diesel type, and, in addition, there are at present in course of construction, under the Society's survey, over 30 sets of these engines. It may be remarked that 12 of the 46 vessels are equipped with 'Werkspoor' four-cycle Diesel engines."

"In addition to the foregoing, several vessels have been fitted with oil engines of other than the Diesel-type, among which may be mentioned 11 fitted with hot-bulb engines made by Messrs. J. & C. G. Bolinder's Mekaniske Verkstads Aktiebolag, of Stockholm, and this type of engine is to be fitted in more than 30 vessels which are being built under the Society's inspection."

"During the year under review, seven vessels classed by the Society have been fitted with Diesel engines. Three of these were built by Messrs. Harland & Wolff, Ld., and engined by Messrs. Burmeister & Wain, of Glasgow, and the remainder were built and engined by Messrs. Burmeister & Wain, of Copenhagen."

"The past year has witnessed a revival of wood shipbuilding in America which has been brought by the abnormal demand for steel. Since the beginning of 1916, the committee have considered proposals for the construction of several vessels to be built of wood, ranging from 100 feet to over 300 feet in length, the dimensions generally being similar to those of the four, five and six-masted schooners built in the United States, the largest of which are 320 feet in length and 50 feet in breadth."

"It is proposed to build several of these wooden vessels on the Pacific Coast for use in the lumber trade to Australia. The principal wood used in that part of the country for ship construction is Oregon pine, or Douglas fir. This wood is found in great abundance on the Pacific slope, where it can be obtained in suitable lengths and sizes. Steel reinforcements are introduced in the larger vessels at the keel and gunwale, and at the various decks, in order to give the necessary longitudinal strength to the structure. Plans have also been approved by the committee for several wooden vessels to be built on the Florida coast. In addition to the sail power, the vessels are fitted with single, or twin-screw oil-engines for auxiliary use when necessary, donkey boilers being supplied for working windlasses and winches."

When consideration has been given to the fact that the greater number of European and British shipbuilders who are builders of Diesel engines have been prevented from constructing motorships by war conditions, it will be realized that under the circumstances sea-going motorship situation has made very fine progress. Furthermore the motor vessels classified by Lloyd's do not constitute all the ships of that type built; because many have been classed with other Societies.

AMERICAN MARINE-OIL-ENGINE BUILDERS.

For the benefit of shipowners interested in marine motors of the heavy-oil type, we give herewith a list of engines being manufactured, or just about to be manufactured, in this country.

MARINE DIESEL-TYPE ENGINES.

Make.	Des. of Eng.	Type.	
American-Krupp Diesel Co.	Krupp	4 & 2	Cycle
Atlas Gas Engine Co.	Atlas	4	"
Bethlehem Steel Co.	Bethlehem-West	4	"
Busch-Sulzer Co.	Busch-Sulzer	4 & 2	"
James Craig Eng. & Mach. Wks.	Craig	4	"
Wm. Cramp Ship & Eng. Co.	Burmeister & Wain	4	"
Fulton Mfg. Co.	Fulton	4	"
Gas Engine & Power Co.	Speedway	2	"
McIntosh & Seymour Corp.	Polar	4	"
Newport News Ship. & D. D. Co.	Werkspoor	4	"
New London Ship & Engine Co.	Nlseco-M. A. N.	4	"
New York Navy Yard	Nlseco-M. A. N.	2 & 4	"
New York Shipbuilding Co.	Werkspoor	4	"
Seattle Machine Works	Own Design	—	
Seattle-Astoria Iron Works	Troyer-Fox	2	"
Standard Gas Engine Co.	Southwark-Harris	2	"
Standard Motor Const. Co.	Standard	4	"
Southwark Foundry & Mach. Co.	Southwark-Harris	2	"
Union Gas Engine Co.	Craig	4	"
Union Iron Works	Union & Nlseco	4	"
Winton Engine Co.	Winton	4	"
Wisconsin Motor Mfg. Co.	Wisconsin	2	"

Total—22 firms.

SURFACE IGNITNION (SEMI-DIESEL) MARINE OIL ENGINES.

Maker.	Des. of Eng.	Type.	
Blanchard Machine Co.	Blanchard	4	Cycle
Bolinders Engine Co.	Bolinders	2	"
Burnoil Engine Co.	Burnoil-Brons	2	"
Fairbanks-Morse Motor Co.	Fairbanks-Morse	2	"
J. H. Hansen & Co.	Skandia	2	"
Heaps Engineering Co.	Heaps	2	"
Kahlenberg Bros. Co.	Kahlenberg	2	"
Marine Mechanical Works	Gaertner	2	"
August Meitz Engine Co.	Meitz & Weiss	2	"
Remington Engine Co.	Remington	2	"
Skandia Engineering Co.	Skandia	2	"
Standard Motor Construction Co.	Standard	2	"
Stanley Company	Stanley	2	"
H. W. Sumner Co.	Sumner	2	"
United Engineering Works	United-Gray	2	"
Weiss Engine Co.	Weiss	2	"

Total—16 firms.
Grand Total—38 firms.

SUMNER ENGINE IN OPERATION.

Invitations were extended Nov. 1st by the H. W. Sumner company of Seattle to all interested to attend daily demonstrations of their first engine in operation at the Puget Sound Iron & Steel Works, Tacoma, since when many shipowners, engineers and others have availed themselves of this opportunity.

This oil engine, designed by H. W. Sumner, a Seattle engineer, is of the two-cycle hot bulb type, in four cylinders and rated at 350 b. h. p. Standing 16 feet in height a close resemblance to marine steam practice is noticeable in its open base construction.

The engine is directly reversible and the controlling mechanism is placed at the level of the cylinders and operated from an upper platform. Whilst the Sumner engine embodies all the best features of modern two-stroke oil engines, there are many original features introduced in the governing, control and reversing mechanism. Several lengthy tests have been made to the satisfaction of Lloyd's surveyors and the consulting engineers representing Swayne & Hoyt of San Francisco, for whom the first two sets are being built.

It is reported by the H. W. Sumner Co. that several orders have been received since the official tests were made. A fully illustrated technical description of this engine will be given in our December issue.

Authoritative Comparison Between Steam and Motor Vessels

By T. Orchard Lisle

The first comprehensive article on the above subject appeared in MOTORSHIP for August last, when comparison costs were given between steamships owned by the American-Hawaiian Steamship company and Diesel motorships owned by the Anglo-Saxon Petroleum Co. The figures then given were authentic.

But in the following article it has been necessary to assume that there are three fleets of 12 ships—one fleet being oil-fired geared-turbine steamers, one coal-fired reciprocating engine steamers, and the third four-cycle Diesel type oil-engined vessels; all 36 vessels being of the same dimensions and power, and each having a displacement of 9,000 tons and engines of 3,000 indicated horse-power. These fleets are owned by Messrs. "A." "B." & "C." respectively, and as will be seen the economies and excess earnings of the motorships amount to one and three-quarter million dollars sterling per annum.

As it is not possible to definitely ascertain the indicated horse-powers of turbines the fuel-consumption of the geared-turbine ships must be taken as 0.9 lbs. per i. h. p. hour, based on a water consumption of 11½ lbs. with a good modern marine boiler. The other two consumptions are taken from records of ships in service and all may be regarded as a very reasonable average. Thus we have the following fuel consumptions per indicated horse-power per hour.

Geared Turbine Ships.	Diesel Motorships.	Coal-Fired Ships.
0.9 lbs.	0.3 lbs.	½ lb.

In each case the sea-speed of the ship when loaded will be about 12 knots; but, possibly the Diesel-driven vessel will be one-eighth of a knot slower than the two others because of the slightly higher revolution speed of the propeller; better efficiency being obtained in rough weather by having a lower propeller-speed. But, in the event of very rough weather, all three ships would have to be slowed down, so this possible speed reduction need not be taken into account in this article as it will effect the fuel costs but little. Furthermore, the Diesel ship can provide as much as 40 per cent overload power in case of extreme emergency which the steamers cannot do. Generally speaking the speeds obtained in service will all be about equal when the vessels are loaded, because the mass that has to be pushed through the water will be the same in weight and shape in each case.

For the purpose of this article we will assume that the three fleets are maintaining a regular schedule between New York and Great Britain, making the outward voyage fully laden, but returning half-loaded, and that the freight rates average out for the year at $15 (60/-) per ton outward, and $12 (48/-) per ton homeward.

As a rule 15 days will be required per one-way voyage, and the coal-fired ships will bunker at each end, whereas the oil-fired and Diesel vessels will bunker at the port where oil-fuel is the cheaper, namely America.

The fuel consumption per 24 hour day per ship will be as follows:

Geared-Turbine Ships.	Diesel Motorships.	Coal-Fired Ships.
30 tons.	10 tons.	39½

Thus the fuel consumptions (at sea) for the return voyage will be 900 tons, 300 tons and 1,185 tons respectively. The turbine ship will use a low grade of oil fuel, say at $8.75 per ton, while the Diesel ship will use a little better oil-fuel (this is advisable for cleanness but is not imperative) and will pay $10 per ton, while coal will cost the steamer $5 per ton in New York. (The price is $6 at time of writing), and $4.50 per ton in Great Britain.

In order that the author cannot be accused of being prejudiced in favor of the motorship, it will be noticed that he has taken a fairly high price for oil-fuel, and a low price for coal. Curiously, this fact makes the geared-turbine less economical than the coal-burning vessel, yet hardly effects the economy of the Diesel ship.

The figures just mentioned give an annual fuel bill per ship for sea consumption (port consumptions not included) of:

Geared Turbine Ship.	Diesel Motorship.	Coal-Fired Ship.
$70,875.00	$27,000.00	$50,147.00.

Hence we obtain the following results for the fuel bills of the three fleets of twelve ships:

Diesel fleet saves over coal fleet.....$275,766.00
Diesel fleet saves over turbine fleet.... 444,500.00

However, the Diesel fleet will use more lubricating oil than the steamers so that from the above economy effected we will deduct $10,000.00.

This economy alone should be sufficient to induce shipowners to build motorships instead of steam. But, the said savings are less than one-quarter of the gains to be obtained through the adoption of motorships. How this results we will now show.

First we will take the geared-turbine ships. Their displacement is 9,000 tons each. Their dead-weight capacity will be 6,400 tons, which includes 950 tons fuel, 150 tons of water, 40 tons drinking water, 30 tons stores and two tons for the crew, which leaves a cargo carrying capacity of **5,228 tons each.**

The coal-fired ship will have a dead-weight capacity of about 6,350 tons, including 1,235 tons fuel, 150 tons of water, 40 tons drinking water, 30 tons stores and two tons for the crew, **leaving a cargo-carrying capacity of 4,883 tons.**

The Diesel motorship will have a dead-weight capacity of 6,500 tons, and this will include 350 tons of oil-fuel, 100 tons water for donkey boiler, 40 tons drinking water, 30 tons stores and two tons for the crew, **leaving a cargo-capacity of 5,978 tons.**

Incidentally it will be seen that the three fleets of twelve ships per fleet thus will have the following aggregate capacities and earning powers per voyage per fleet.

One Outward Voyage (12 Ships Fully Loaded).

Geared-Turbine ships=62,736 tons at $15 per ton =$941,040.00.

Coal-Fired ships=58,716 tons at $15 per ton= $880,740.00.

Diesel Motorships=71,736 tons at $15 per ton= $1,076,040.00.

One Homeward Voyage (Twelve Ships Half-laden)

Geared-Turbine ships=31,368 tons at $12 per ton =376,416.00.

Coal-Fired ships=29,358 tons at $12 per ton= $352,296.00.

Diesel Motorships=35,868 tons at $12 per ton= $430,416.00.

This gives in earnings per round voyage per fleet the following respectively: $1,317,456.00 (geared-turbine), $1,233,036.00 (coal-fired) and $1,506,456.00 (Diesel motor). But as each fleet will make nine round voyages per annum, it is only necessary to multiply the figures by nine to obtain the earning powers of each fleet for one year, namely, $11,857,104.00; $11,097,324.00, and $13,558,104.00. Consequently the 12 Diesel motorships earn $2,460,780.00 more than 12 coal-fired ships; 12 Diesel motorships earn $1,701,000.00 more than 12 gear-turbine ships.

To these greater earning powers of the motorship fleet we have to add the amount, which previously figured out, was derived from the great fuel consumption economy. These were, it will be remembered, $265,766.00 over the coal-burning fleet, and $434,500.00 over the geared-turbine fleet, we having deducted the $10,000.00 for lubricating oil.

Finally we get the following annual grand totals: Diesel-fleet earns and saves $2,726,546.00 more than coal-burning fleet; Diesel-fleet earns and saves $2,135,000.00 more than geared-turbine fleet.

There are many other minor economics that can be effected with motorships, such as no stand-by charges, the use of the exhaust gases for operating the auxiliaries when at sea, etc., but these do not effect the huge totals, so have not been included.

Now if the fleet owned by Messrs. "C" can be operated at a cost of one-quarter of a million dollars less per annum than his best competitor, and in addition can produce an extra income of nearly one and three-quarter million dollars, they can easily put Messrs. "A" and "B" out of business during bad times when the amount of cargo to be carried is limited, because "C" is in the position to accept cargoes at much lower rates than "A" or "B" without effecting the equivalent normal steamship profits.

Photo by James & Merrihew, Seattle

CAPT. LOUIS HANNEVIG.

"It's an ill wind," etc. The European war has raised the subject of this sketch from a modest Norwegian sea captain to a millionaire shipowner.

Captain Hannevig is one of six brothers who are now prominent in the shipping world with offices in Christiania, Norway, and New York. Our interest, however, is centered in the branch of the company known as Hannevig & Jensen, of which Capt. Louis is the senior partner. This firm has placed orders on the Pacific Coast for steel vessels running into large tonnage, their most important operation being the organization of the Anderson-Zelzik Shipbuilding company, to be located on Lake Washington, and which will erect two 9,000-ton freight steamers for Hannevig & Jensen. About $200,000 will be expended on this plant before a keel is laid. A further order has been placed by Hannevig & Jensen with the Smith & Watson Iron works in conjunction with the Northwest Steel company, both of Portland, for four 8,800-ton steel steamers. Captain Hannevig has other vessels building at San Francisco.

HOQUIAM TO HAVE ANOTHER YARD.

The Hoquiam Shipbuilding company, incorporators Frank H. Lamb, president; P. J. Mourant, vice-president; F. G. Foster, treasurer; T. C. Soule, secretary; W. R. Marvin, manager, and Everett M. McDade, superintendent.

The company is capitalized at $50,000. Like other up-to-date builders it will specialize in one type of lumber carrier, an auxiliary motor wooden schooner with about 2,000,000 feet b. m. capacity. A site at Hoquiam, Wash., has been decided upon and operations for a four-way yard are to be put in hand right away.

COLUMBIA ENGINEERING SHIPYARD EXPANDS.

President S. M. Mears contemplates extending the above plant at Portland to take care or additional orders. The work in hand consists of four wooden auxiliary schooners being constructed to the order of Capt. M. T. Snider, of New Orleans, who recently purchased the "June," later orders for mortorships were acquired by President Mears when recently in New York.

W. H. Curtis, former superintendent, has recently severed his connection from this company. His successor has not yet been named.

SELL TWO MORE LUMBER SCHOONERS.

The Washington Shipping Corporation, of Seattle, have sold their third and fourth vessel to Norwegian interests. Work upon No. 1 and No. 2 is being pushed ahead and Manager Sloan hopes to get them afloat at an early date.

MOTORSHIP

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AWAKE! AMERICAN SHIPOWNERS.

In this issue will be found extracts from a speech made by Sir James Mills, president of the Institute of Marine Engineers, Great Britain. Sir James has brought about such drastic reforms in shipbuilding that his reputation and preeminence as an authority is undisputed.

In reply to the speech made by Sir James, Mr. J. T. Milton, vice-president of the institute of marine engineers and chief engineer to Lloyd's Registry, outlines the intention of British engineers and manufacturers to pool their expert knowledge and experience in the development of the marine oil engine and the motorship, endeavoring to obtain government assistance in meeting the competition of other nations.

Some time past this identical suggestion was made in Motorship for the benefit of American shipowners and oil engine manufacturers.

Great Britian, although engaged in war with all resources taxed to the utmost, can find time to make the development of her motorships a national issue, whilst Americans intoxicated with temporary prosperity are satisfied to build foreign ships and further to continue to equip new vessels with steam.

"Motorship" exhorts American shipowners to awake and join hands with American engineers and manufacturers in making the development of her motorships a national issue also, in opposition to other powers who will force our miserably few freight steamers out of commission within the next few years, unless immediate action is taken to prevent our everlasting humiliation in the eyes of the shipping world.

WILL THEY LAST?

Whilst visiting Victoria, B. C., this last month we came across the "Inca," as fine a wooden fore-an'-after as ever man built. She was lying at the Cameron Lumber Co.'s mill loading 1,400,000 feet of lumber for Deloga Bay, South Africa. Inca was built by the Hall Bros., of Port Blakeley, just twenty years past or the year 1896, and is as sound as a bell today. Capt. Rasmussen, who has had command of her for many years, is retiring on account of ill health, and their parting is something which a landsman cannot understand. She has never lost a dollar through mishap to cargo and has always been a steady money maker for her owners. The old ship is good for many years to come and when any lubber talks bosh about the few limited years of a fir ship first tell him of this fine vessel and then choke him with a cheap cigar.

NOW IS THE TIME TO SUBSCRIBE.

We urge that readers who are interested in the specific information published in "Motorship" send in their subscription orders in order that they shall receive each edition promptly and regularly as issued.

While we are mailing some sample copies of each issue this journal will not have a promiscuous free distribution. To those who wish to follow the development of the marine internal combustion engine a year's subscription will be an excellent investment.

Back copies of all numbers from the first issue can still be furnished if ordered at once.

HEAVY OR MEDIUM RESIDUAL FUEL-OILS FOR MOTORSHIPS?

There has been much misconception among shipowners as to what grade of fuel it is advisable to use for motorships, and we take it upon ourselves to put forward a little explanation and some suggestions on the subject, whereby owners, engineers, and marine-superintendents may become mind-free from some of the misunderstandings which seem to have arisen. It appears that many writers and some exuberantly enthusiastic salesmen have taken too literally the engine-builders' claims of Diesel or surface-ignition engines successfully burning the heaviest grades of crude and residual oils, whereby not a few shipowners have gotten to understand that conditions under which the engine or ship have to work make little or no difference, and that reliability and uninterrupted running should be obtained, no matter what the circumstances of operation.

The boiler of a steamer will generate steam with any grade of coal, but the discriminating owner endeavors to select good coal because he knows that better results will be obtained. In the same way, he should carefully study the oil-fuel situation where motorships are concerned. Such is his own interests.

There is not the slightest doubt but that the Diesel-type engine will combust the heaviest grade of crude-oil, and under certain special conditions a Diesel engine has been run on coal-dust. But this is a different matter where a ship running on long distance non-stop voyages such as 15, 20, 30 or even 40 days, under which circumstances unexpected conditions may arise.

Oils differ much in constitution. Some have large percentages of dirt, asphaltum, sulphur, and other component parts, others have small quantities of the one and large percentages of the other, while some oils are so thick that they have to be heated before they will flow freely along the feed-pipes, or before they will follow the stroke of the fuel-pump. Some are tar oils, some vegetable oil, but most are of the mineral variety.

To take an example, an oil of 0.862 specific gravity, a California value of 17,430 b. t. u. a flash-point of 140 deg. F., with 70.0 per cent asphaltum and 4.6 per cent sulphur. This is a very heavy oil, but a Diesel engine will work with it successfully and without ill-effect under certain conditions.

But imagine its use on a ship making a voyage from San Francisco to Australia. At times there may not be more than one engineer, an assistant, and an oiler or cleaner, on watch. If they were at all indifferent to their job the engine would get dirty after about a week—remember the engines operating night and day without a let-up—and a dirty engine never will give the best results.

Even with fairly careful attention on the part of the engine-room staff, a week, or ten days steady running probably would see some of the piston-rings stuck with a gummy deposit; a carbonaeous substance may find its way down into the bearings and thereby cause trouble; the fuel-valve might occasionally stick, the fuel-pipes clog, and perhaps the exhaust valves (if four-cycle) would become pitted, or their seats get partially clogged—all due to the bad grade of fuel oil.

Even when using a little better oil than the above—yet still heavy oil—many ships' engineers run their engines on a light residual-oil for about thirty minutes each day in order to clean the inside of the engine, using for the purpose such a clean residual oil-fuel as gas oil, (solar oil) or distillate or fuel oil.

The U. S. Navy Department uses quite a light residual oil for the Diesel engines of its submarines for regular running, because they have not to figure on the cost, and thus can avoid the extra work caused by the use of low grade fuel.

Unless material economies can be obtained we strongly advise shipowners to use medium grades of residual, or crude oil-fuels for their motorships and thus facilitate the reliable operation of the oil-engines. Of course, in cases where the price of a low grade oil is vastly different from the next grade it may pay better to use the dirty oil, and occasionally stop the engine to clean it, but as we before stated much depends upon the oil itself as to the amount of extra attention that may be needed. The full Diesel-type engine will, of course, use heavier oils than the surface-ignition type.

To illustrate how little the use of a medium grade oil in preference to a low grade means from an economical aspect we will give a few figures.

The prices were given us on the day of writing by a well-known oil company. Low-grade crude-oils today average from $1.26 to $1.68 per barrel in the New York City vicinity, and better fuels such as Navy fuel-oil run from $1.68 to $2.10 per barrel, so we will take mean prices of $1.50 and $2.00 respectively.

Now a properly designed 10-knot full-powered Diesel ship carring 4,000 tons net of cargo in her holds will use about 100 to 130 tons of oil fuel in 15 or 16 days voyage, so that at the most her bill with the cleaner fuel-oil will not exceed $1,500 for such a voyage.

Should her owner decide to use the low-grade fuel, the bill will come to about $1,125. That is to say, a saving per voyage of about $375 is effected for which small economy the engineers are going to have somewhat harder work when they reach port—if not at sea—and that the constant and regular running of the engines may be interfered with. Hence, in this particular case it is a false economy.

Such by no means applies to all cases, because on some services it may be important to use the lowest grade of oil that the engine will burn. But from the foregoing it is obvious that it will pay shipowners to carefully weigh their own particular and local conditions before deciding upon the fuel. When a new ship is taken into commission it is a good plan to use a clean fuel such as solar-oil at first, then gradually change into heavier oils when the engineers are getting to fully understand the Diesel engines.

After all said and done, although the running economy of a Diesel engine is a very great point, it is not the most important today, because it is the extra cargo carried by the motorship that forms the most valuable feature today, so the shipowner can afford to use fairly good oil-fuel, and the horse that does the work deserves to have good food.

THE BRAMELL POINT.

Very considerable space has been devoted in this issue to the details of the trials of the new motor vessel Bramell Point. She represents an important development of the marine internal combustion engine and it is only fitting that she should be very completely dealt with in this journal, whose object it is to encourage and properly record such innovations and progress as she represents. The details are unusually complete and such rarely are obtainable for publication from engine-builders, ship-builders or shipowners. We hope the example furnished by the open policy of those concerned with this vessel will be followed by many others, which will be to the benefit of the entire motorship and internal combustion engine industry.

WORLD'S LARGEST MOTORSHIP GOES INTO COMMISSION.

The largest and highest powered motorship in the world went into commission during the latter part of October, and put to sea on her first voyage on November 4. This is the U. S. Navy tanker "Maumee," about which so much has been heard during the last year. She is a vessel of 15,000 tons displacement, and has a cargo capacity of 10,000 tons, or about 2,500,000 gallons of oil. The machinery of this interesting vessel consists of two six-cylinder single-acting Nürnberg-Diesel type crude oil engines of the directly reversible two-stroke cycle-type each, having a designed output of 2,500 b. h. p. at 130 r. p. m., but on the shop trials over 3,050 b. h. p., which is equivalent to about 4,000 i. h. p., was developed when turning around 140 r. p. m. This latter power, of course, is at an overload, so that she will not develop such high power in actual service. The drawings of the machinery was supplied through the New London Ship & Engine company, of Groton, Conn.

As yet no official trials have been run, and these may take place at any day, so we are holding over the complete description of the ship and her machinery until our next issue, by which time we hope to be in possession of the results of the trials.

The dimensions of the Maumee are 455 feet length b. p. with 56 feet breadth, and with loaded draught of 26 feet, 4 inches. The designed sea speed is 14½ knots. She proceeded to sea without her chief engineer, Lieut. C. W. Nimitz aboard, whose hand had been badly hurt by revolving gears, and he had the misfortune to sever one finger. Our sympathies are with Lieut. Nimitz who has been in charge since the outset, of the entire construction of the Diesel machinery of the vessel, and who is responsible for a number of improvements in minor details over the original design.

THE ENGINEER QUESTION

Already we have dealt with one phase of the engineer question, and now another query arises which perhaps is just as important as the other, namely, the number of certificated engineers to be carried aboard motorships. At present there are no definite rules regarding this matter, the Steamboat Inspection Service having, for the time being, left the decisions in the hands of the Local Inspectors, each case being treated on its particular merits.

The large full-powered Diesel-ship and the big oil-engined auxiliary being quite new developments to this country, it will be obvious to the "thinking man" that the course of action temporarily taken by the authorities is a wise one, and is much better than wildly rushing into framing new laws, which no doubt would prove totally unsuitable, and thus leave the motorshipping situation in an undesirable plight. Dealing with individual cases will enable the officials to secure a comprehensive knowledge of the requirements of the different types of vessels. It hardly is necessary to state that foolish legislation is the curse today of the American steamship business and industry, so every endeavor must be made to avoid ridiculous laws being framed for motorshipping. This being the case, it will be well for all motor shipowners to furnish every assistance to the local inspectors, and thus have the Department co-operating with them; which will be better that causing a possible antagonistic tendency.

A contemporary recently took up the question in all good spirit; but we are inclined to consider their views somewhat mistaken; due, possibly, to a hasty judgment and without deeply probing into the real facts. We quote them, as follows:

> "The recent action of the government inspectors in insisting upon the same complement of engineers on motorships as upon steam vessels is a matter giving vessel owners much cause for concern. The motorship problem is a new one, quite as much so, no doubt, to the government officials as to the owners of the vessels themselves, but there is no more reason in insisting upon a vessel carting around superfluous engineers than there would be in insisting upon a full complement of coal passers just because it is required on steam vessels. We have repeatedly commented upon the necessity of special legislation, and a new set of rules that will especially fit the construction, equipment and operation of motorships."

In the first place, full-powered Diesel motorships of the ocean-going type need, and must have, a larger engine-room staff than a steamer of similar power. At least this is the view of both engine-builders and shipowners who have had experience with large motor craft. But, as no firemen or coal trimmers are required (there being no boilers except a donkey-boiler), there really is a fair saving on the actual number of men employed.

At the same time, it is usual to pay better wages to motorship engineers, because of the harder work,—we express it as "harder work" because the engineers must devote careful attention and study to the machinery until they become thoroughly familiar with the peculiarities pertaining to the marine oil engine, and until they do become well versed in the machinery and its operation, quite a number of minor adjustments, and sometimes repairs, have to be made both at sea and when in port, and such occupy quite a respectable amount of time. With a good engine, however, and with full possession of the fundamental details of its requirements, the work becomes no more arduous than with a steamship. In fact more pleasant, because of the absence of heat from the boilers during the summer months, or in tropical waters.

However, many new vessels soon will be placed in service, which will mean the introduction of many additional steam engineers to the operation of oil engines, and under crewing these vessels would not be a wise step.

Having regard to the large wooden motor-auxiliary class of sailing ship, some owners apparently would like to adopt the idea that not more than one certificated engineer and an unskilled assistant are sufficient for the needs of such vessels, even if ocean-going craft.

This attitude is quaintly curious. A shipowner will buy a $2,000 automobile for private use and will not hesitate about engaging a chauffeur-mechanic at $30 per week. Now the machinery of a large motor-auxiliary ship will cost from $40,000 to $50,000 and even more, and requires far more attention than the car. Yet the same man will object to furnishing and paying for adequate and skilled attendance to the engines of the unit that is a money producer.

If the wages and board of one or two extra engineers are going to at all seriously affect the profits to be derived from auxiliary motorships such as now are building, then shipowners may just as well abandon plans for further vessels. To be candid, the economies to be derived from the use of oil-engine power, compared with steam or sail, are so great that the engineer question does not enter the situation, so far as expense is concerned.

But there can be no doubt that auxiliaries should be divided into three classes, namely:

1. Large sea-going ships.
2. Large coastwise vessels.
3. Small coastwise craft.

Class one undoubtedly needs three engineers, or at the least two certificated men and one assistant. Modern vessels of this size have twin engines aggregating 400 to 650 b. h. p., or equivalent to about 600 to 800 steam indicated-horsepower respectively. Often the engines are required to be run for a week or more at a stretch, during which time the engine-room crew should need three watches, or one engineer each watch.

When the vessel is under sail alone and the engines are idle these men are regarded as a total loss, but really their wages from the premium of a good insurance policy on $50,000 worth of machinery, also their presence, ensure the ship making good time. If she is known as a good time-maker she will be enabled to obtain good freight rates, and the extra percentage in the freight will more than cover the expense of the engineers.

With class two the situation is somewhat different, because comparatively short voyages are made, which gives the engineer or engineers, more opportunity for rest. The number of men should depend entirely upon the number and power of the motors.

Class three deals with small vessels of which there are dozens in service round our coasts. Such craft have motors of from 10 to 60 horsepower, and which generally can be attended to by the crew, or by one skilled, or semi-skilled, man. Three certificated engineers on vessels of this type would be ridiculous.

Next we have the full-power Diesel, and Surface-Ignition, oil-engine driven ships. These should be divided into two classes, viz.:

1. Large oceangoing and large coastwise vessels.
2. Small coastwise boats.

Small ocean-going mercantile motor-craft are so rare, that they could be dealt with individually on their own merits. Large coastwise ships generally have to make quite lengthy voyages to will require the proper watches, hence the same number of men as their ocean-going sister-ships.

Very few motorship cases have yet come before the steamboat inspectors and according to the authorities in New York—we quote their own words:

> "There are no pamphlets published giving details of how many qualified engineers, or certificated engineers, must be carried aboard large Diesel and semi-Diesel driven motorships and upon large sailing-ships equipped with these types of motors as auxiliary power engaged in coastwise service."

In one case brought before them the local inspectors insisted on one certificated engineer per watch. Perhaps it is just as well to quote the qualification of an engineer for a motorship as defined by the Department.

> "No person shall receive an original license as engineer of vessels of above 15 gross tons, propelled by gas, fluid, naphtha, or electric motors, carrying freight or passengers for hire, who has not served at least one year on motor-boats or in the engineers' department of steam-vessels, or who has not had at least two years' experience in the constructions of marine motor-engines and their installation. All examinations for license as engineer of motor-vessels shall be reduced to writing and filed with the application of the candidate.
>
> "Any person holding a license as engineer of steam vessels desiring to act as engineer of motor-vessels must appear before a board of local inspectors for examination as to his knowledge of the machinery of such motor-vessels, and if found qualified shall be licensed as engineer of motor-vessels." (Sec. 4426 R. S.)

FIRST CARGO THROUGH LAKE WASHINGTON CANAL

The opinions of shipowners, and of engine builders on the foregoing remarks and on the situation in general will be of great interest, and the columns of MOTORSHIP are open for letters on the subject. T. O. L.

OPENS LAKE WASHINGTON CANAL.

The first commercial use to which the Lake Washington Canal has been put was a tow of coal into Lake Union from Puget Sound on Oct. 24, 1916, and the little tug thus honored is as interesting as her historic accomplishment. Resolute is only a shrimp of a tug in appearance, but she handles some awfully big stuff; her steady job being the General Petroleum Co. Barge No. 4, 100 feet by 36 by 11 feet draft loaded, with somewhere like 700 tons displacement, and she drags this around Puget Sound winter and summer like a kid with a toy wagon. Her dimensions are 50 feet o. a., 12 feet beam and 7 feet draft. Her power consists of an 80 b. h. p. N. & S. 3 cylinders 10½x12 4-cycle motor. Everything except the towing bits handles from inside the pilot house. The after one being just within reach through the after door opening.

The man who (with the help of a deck hand) operates this boat is captain, engineer and mate in one and to hear of his exploits—well, that's another story which Peanuts' natural modesty forbids, but Capt. Harkon Berg is a mighty important man aboard the Resolute, and the Resolute is some tug at that.

BUREAU OF FISHERIES ACCEPTS PLANS.

The plans of Martin C. Erismann, Seattle naval architect, have been accepted by the U. S. Bureau of Fisheries for sister vessels to be used in South eastern Alaska. Each will be 48 feet in length with a beam of 12.5 feet, and equipped with a 25 b. h. p. four-cycle motor, making wholesome little cruisers of liberal displacement and accommodation.

Bids upon their construction will be called for by E. J. Brown, agent Bureau of Fisheries, L. C. Smith building, Seattle. M. C. Erismann will supervise the construction.

MOTORSHIPS FOR W. R. GRACE & CO.

The two new motorships now being built by Mathews at Hoquiam and described in our November issue, are to be named Sant Elena and Santa Isabel, respectively. Twin Bolinders are to be installed in these vessels.

A CONSISTENT PERFORMER.

The purse seine boat "Age of Reason" has made good net earnings for her owner, Capt. Chas. Knutsen, for two years past. Her dimensions are 46 feet in length, 12 feet beam, and 4 feet 6 inches draught and installed with a 25 h. p. Clay four-cycle engine supplied by the Pacific Marine Engine Co., of Seattle.

"AGE OF REASON"

NEW PORTLAND SHIP YARD.

Among other new organizations to enter the wooden shipbuilding field is the Oregon Shipbuilding company, of Portland, Ore., capitalized at $200,000. Among its executive heads is W. M. Umbdenstock of Umbdenstock & Larson. J. Fred. Larson is associated with the Heath Shipbuilding Co., also of Portland. John H. Price is mentioned as manager of construction and requires no introduction on the Pacific Coast, having for years filled the same position with the McCormicks at the St. Helens Ship Yard, lately turning out the "City of Portland," "June" and "Ruby," all handsome auxiliary motor schooners. This company, whilst figuring on contracts, is open to inquiries from shipowners.

ASTORIA SHIP YARD REORGANIZED.

Following the launch of the "City of Astoria" by the McEachern-Standifer-Clarkson Shipbuilding Co., Astoria, Oregon, the announcement was made that the A. O. Anderson company, of Copenhagen, had purchased a controlling interest in this concern, also that they have taken over all five vessels, "City of Astoria" launched and the four in course of construction, further that they have placed orders for an additional two to be commenced immediately.

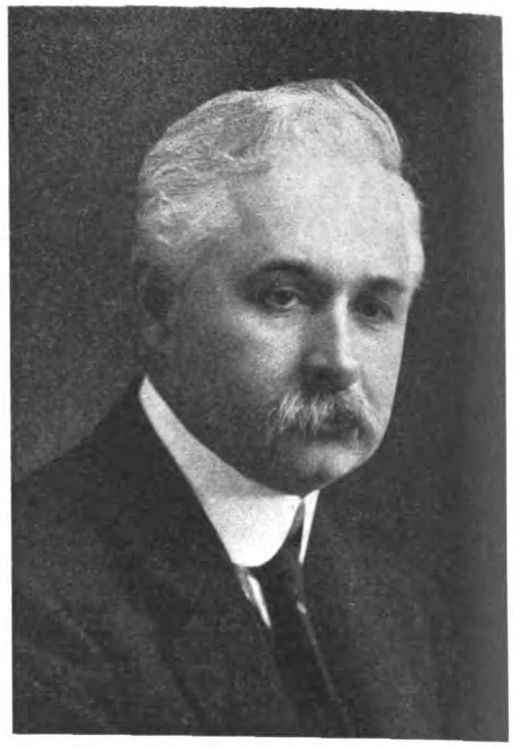
J. A. McEachern is to continue as stockholder and general manager, Guy M. Standifer and James Clarkson retiring and devoting their shipbuilding interests solely to the Standifer-Clarkson Shipyard at North Portland harbor, where they have two wooden auxiliary lumber schooners in course of construction.

VANCOUVER SHIPBUILDER VISITS SEATTLE.

James Wallace of the Wallace Shipyards, Ltd., was a visitor to Seattle recently.

Mr. Wallace is building four of the five-masted auxiliary government subsidized schooners at Vancouver, B. C., the work upon which is progressing rapidly, all being sealed up and in course of planking. Mr. Wallace has been actively engaged in endeavoring to better the conditions for the construction of steel vessels which has always been at a disadvantage in British Columbia owing to the tariff on steel.

Two of the motorships now under construction in British Columbia, "Geraldin Woolvin" and the "Mabel Brown" have each been chartered to carry lumber from the Hastings mill, Vancouver, to Sidney, at 120 shillings, and to Melbourne for 130 shillings, by the Canadian Trading Co., loading in March and April.



E. W. PETTER

Managing director of Petters Limited of London, England, who recently visited U. S. A. for purpose of organizing American company to manufacture their direct-reversing marine oil engines.

America's First Large Mercantile Motorship

Exclusive Account of the Trials of the 1500 B. H. P. BRAMELL POINT With Details of Her New Model Bolinder Crude-Oil Engines

By THOS. ORCHARD LISLE

SUNDAY, October 29th, 1916, was a noteworthy occasion for all those who were aboard the new triple-screw motorship BRAMELL POINT, which that day ran her preliminary trials in the Chesapeake Bay. For upon the success of the propelling machinery of this ship may have rested the future of one of the most important branches of the marine residual-oil internal combustion engine.

Because, in addition to being the first large mercantile motorship built in the United States, the BRAMELL POINT is equipped with machinery that is way beyond the power of any similar type of marine engine in service anywhere in the world, and they exceed in dimensions and output what a few years ago would have been the wildest anticipations of builders of that class of motor. She also is the first large triple-screw motorship.

Her engines are of the surface-ignition or hot-bulb type, so often erroneously referred to as the "Semi-Diesel." In other words, the compression alone is not utilized to obtain sufficient heat to burn and expand the fuel, but a heated surface, or chamber, is provided upon which the fuel-oil is sprayed in the form of a fine stream without the use of a highly compressed air-blast, hence the syllogistic term "surface ignition oil-engine."

When one casually reflects upon the history of the marine oil engine, the thought may suggest itself that these makers —the well-known Bolinder Engine Company, of Stockholm, Sweden,—have been almost unduly bold in taking such a step as 1500 b. h. p. in one ship, because it is nearly double the power of any existing hot-bulb engined vessel. This, however, is not really the case because their extensive experience with motors of this type, combined with their cautious policy and sound engineering practices, would indicate that in building these big engines they have made no mistake and that previous Bolinder reputation should in no way be impaired.

Their convictions were borne out by the trials of the BRAMELL POINT and the continuation of the initial performances when under ordinary service conditions probably will mean the most serious challenge the true-Diesel engine ever has known—and, hitherto the true-Diesel motor of 400 b. h. p. and upwards has had no competitor.

The writer, who has no connection whatever with Bolinders fully remembers when the Bolinders Company installed their first 320 h. p. marine engine of this design in the m. s. ISLEFORD. Sages shook their heads at such a daring venture; but her performances at sea were of such a nature, that the officials at a foreign Admiralty suddenly "sat up"—rubbed their eyes—and purchased her without compunction.

That was about four years ago, since when Bolinders have turned out hundreds of sets of the same power for shipowners all over the world. Today there are built, or building, in the United States of America ships to be equipped with Bolinder engines to the total of about forty thousand horsepower, illustrating that during the last year American shipowners have realized what well-constructed and reliable oil engines mean to their business.

All this goes to demonstrate how much successful or non-successful trials of the BRAMELL POINT meant—not only to Bolinders, but to the entire industry; which outlook had fully been weighed by the engine-builders before they undertook the work, and that they had implicit confidence in the results.

In this article the writer—who was present at the trials of the vessel—will describe the new design of Bolinder engine. However, a few words concerning the ship should first be given in order that the performance may more readily be understood.

The m. s. BRAMELL POINT was built by the Baltimore Dry Docks & Shipbuilding Company from designs by Cox & Stevens, of New York, to the order of Hannevig & Johnsen, but purchased while under construction by the Vacuum Oil Company, of New York, for the purpose of carrying oil

between America and Europe, and by the time these words appear in print will have commenced her maiden voyage.

She has been built to Lloyd's 100 A. 1 class, and the hull is on the Isherwood system of longitudinal framing; her length is 306 feet over all; 293 feet b. p., with 47 feet beam; 28 feet moulded depth and 22 feet 8 inches loaded draught. Her gross registry is 3,500 tons and she has a displacement loaded of 7,250 tons. The dead-weight capacity is 5,500 d. w.; but her actual cargo capacity is 5,000 tons, the water, fuel, stores and crew representing 500 tons of the d. w. c.

Having given a general idea of the size of the vessel we now can turn our attention to the machinery, which to an engineer always is the most interesting part of the ship. Generally speaking these engines are similar in design and appearance to the 320 h. p. and other Bolinder marine engines, and have the usual enclosed crank-chamber; but in several important features there are differences which are not apparent to the casual observer. There are four cylinders per engine and the dimensions of these easily exceed those of any previous low-pressure surface-ignition oil engine, being 22 in. diameter by 29 in. stroke.

Seeing that the designed speed is 160 r. p. m. it easily will be understood that the builders' rating of 500 b. h. p. plus 10% overload per engine is most conservative. This is in conformance with the Bolinder policy in running their engine at a very moderate m. e. p., particularly with a new model such as in the present case. As is to be expected, the two-cycle principle of operation has been maintained, so that with this four-cylinder model there are two combustions per half revolution. The cylinders are arranged and operated in pairs.

For the benefit of those not familiar with the Bolinder system and design, we will mention that air is compressed in the crank case by the underside of the piston on the downward stroke and passes through ports, then along a passage to the combustion chamber, where the piston on its upstroke compresses this low pressure air to about 115 pounds per sq. inch.

The upper part of the combustion chamber is heated so that this compressed air becomes very hot, the action of compressing also creating heat. Thus, when the fuel is pumped into the combustion chamber against the above mentioned compression in the form of a cloudy spray, an explosive mixture immediately is formed and combustion automatically occurs without the use of any electrical-ignition device. For starting purposes the "hot-bulb," as it is termed, is heated by a blow-lamp; but, once the engine is running the heat retained from the explosion in the uncooled combustion chamber is sufficient in connection with the compression to fire the next charge. Incidentally it may be mentioned that the clear atmospheric air that comes from the crank-chamber under low pressure is used for driving out the remnants of the exhaust gases of the previous combustion.

Here it is that a change has been made in the design. With Bolinders models of the E-type the fuel is injected by the fuel-pump on to the interior surface of the hot-bulb, the nozzle being mounted on the side and pointed upwards. Whereas in the BRAMELL POINT'S motors and in all other engines of their new model the nozzle of the injector is mounted in the center of the cylinder head, and points down direct towards the piston. Because of this, the passage leading from the hot-bulb to the cylinder has been re-designed, and now there is one vertical opening instead of two diagonal orifices.

Furthermore, the fuel-nozzle is arranged in the center of another nozzle, this second nozzle delivering a continuous stream of air at about 25 atmospheres into the combustion chamber. Not only does this air help to atomize the fuel, and will spray it over the combustion chamber, but being a steady blast, prevents any abnormal temperatures arising within the cylinder hot-bulb and piston, and also adds to the amount of fresh air from the crank-case for the scavenging of the cylinder and the combustion chamber.

This may give the impression that the fuel is injected by air, as with Diesel engines; but such is not the case. The oil is injected directly by the pump, and the presence of the steady stream of air merely is utilized to assist in atomizing the fuel, the main work of atomizing the oil being done by the injection nozzle. Air for this is furnished from a two-stage air compressor that is driven off the forward end of the engine-shaft, the same compressor also supplying air for the starting of the engine at about 12 atmospheres, three steel reservoir starting air-bottles, one for each engine, being mounted at the after end of the engine-room. Attached to the forward part of each engine is a high-pressure air-bottle serving as an equalizer for the injection-air.

The cylinders really are built up in three sections, namely—the cylinder, the water-cooled cylinder-head, and the hot-bulb, all being removable. Hence, there is a chamber of water between the hot-bulb and the cylinder proper, which prevents cracked heads, and dispenses with water-injection. Water-injection always was an unhappy feature of hot-bulb engines, because it meant that a sea-going ship was required to carry about the same quantity of fresh water as of fuel, thus seriously encroaching upon the cargo space. Also fuel containing a higher percentage of sulphur could not be used. With a dry engine, however, the presence of even two or three per cent sulphur in the crude oil fuel will have no bad effect upon the engine if proper care is taken.

By having an individual crankcase for each cylinder, the designers have been enabled to arrange the main bearings outside of the crankcase; thus they easily can be examined or taken out without dismantling any other parts. Also the engineers can feel them while the engine is turning at full speed without any danger of being hit by a moving connecting-rod or crank.

Lubrication is by a series of eccentric and ratchet driven plunger pump oilers. Two oilers with nine plungers each are arranged at the after end of the engine, and one oiler with ten plungers at the forward end, which altogether provided 28 separate automatic feeds to the various working parts. Minor parts are lubricated by drip-feed oil-boxes that the engine-room assistants attend to as part of their duties. Also at the after end are arranged the bilge and water-cooling pumps. These are eccentric driven and are opposed to each other, and their power strokes are arranged simultaneously with the power strokes of the two pairs of engine-pistons, so that a nice balance is obtained.

It is pleasing to note that the previous system of reversing, which will be described below, has been retained, because this is one of the outstanding features of the Bolinder engine. A few minor mechanical alterations have been made in the mechanism, but these do not materially affect the design.

It is generally known that the Bolinders Company build their engines to closer limits than do the better-known European Diesel engine manufacturers. Incidentally the mechanism for controlling and actuating the main and reversing fuel-pumps is considered by many engineers to be one of the cleverest pieces of mechanism ever designed and found practical, so a description is well worth studying.

To ensure of its operation, however, it is advisable to disconnect the engine from the propeller shaft and this is carried out by an expanding clutch. Because of its size it has been found necessary to engage it, or disengage it respectively, in two stages, i. e., two movements of the lever, and this is carried out by a neat ratchet device.

As regards the fuel-pump and reversing-mechanism itself the following description will enable anyone, even if non-mechanical, to understand its operation. At the after end of the engine there are mounted one fuel-pump for each cylinder and one reversing-pump for two of the cylinders, or six pumps all told, and these pumps are operated in pairs by means of two crescent-shaped rockers (one rocker per pair of cylinders), each end of one of the rockers actuating two pumps.

The two pumps at one end of this rocker are auxiliary pumps and are only brought into action for brief periods when the reversing of the engine is desired. The rocking motion for the crescent-rocker is produced by means of an eccentric on the engine-shaft.

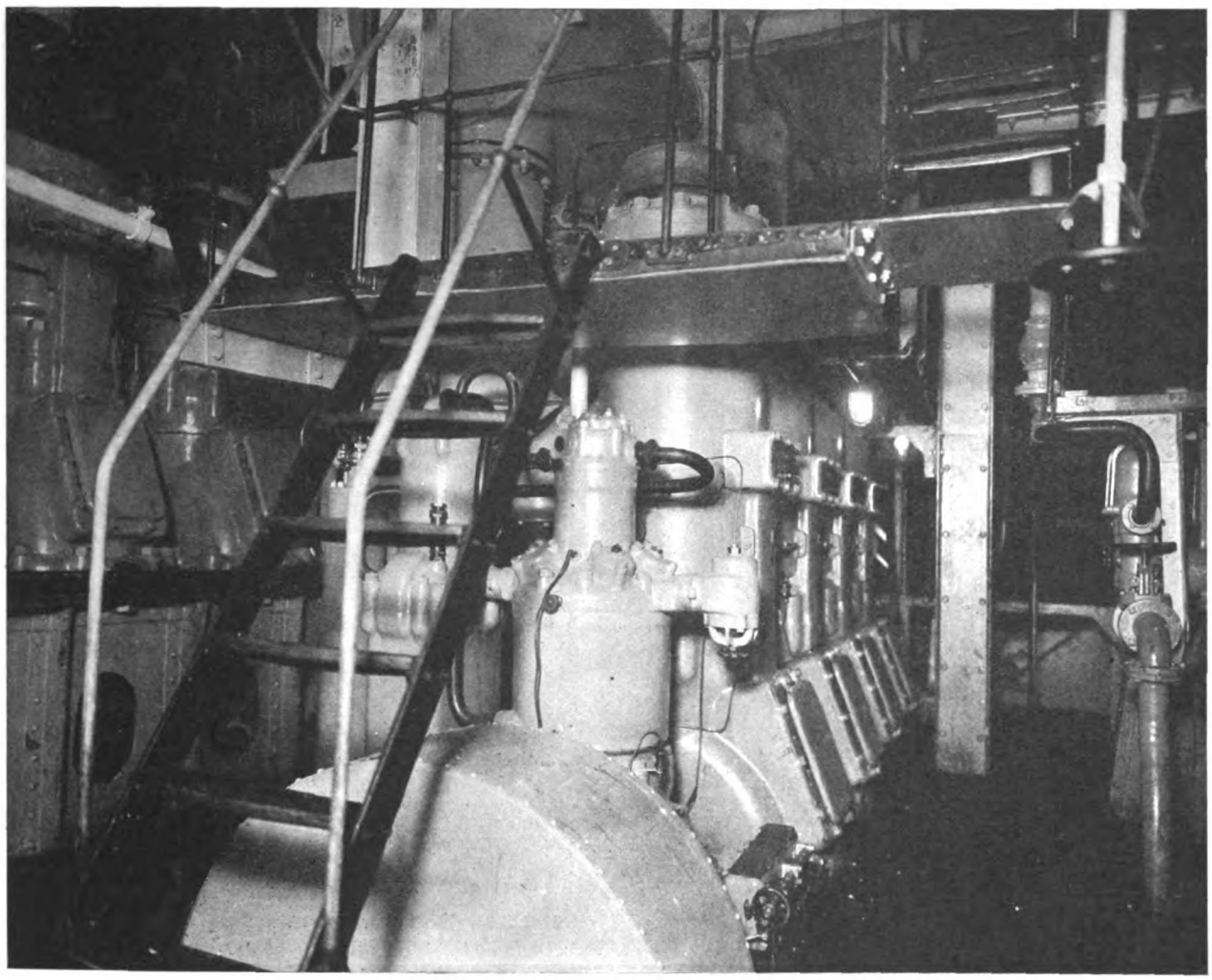
The pump-strikers attached to the rocker have a re-

ciprocating motion and are loosely mounted, and are held down to a stepped-saddle by means of a light spring; so that if the engine turns too fast the inertia of the strikers overcomes the pressure of the springs and the strikers jump at the steps and miss the fuel-pumps. Thus no fuel is injected for that stroke, and consequently the speed instantly decreases.

The manoeuvering device of this spring also is attached to the clutch, so that the engine cannot possibly race when the clutch suddenly is thrown out of engagement, because the governing action is instantaneous. Half a revolution at increased speed is sufficient to cause the strikers to jump clear of the step. Hence it will be understood that this "hit and miss" device is most simple in action and construction; but,—when it is explained that the stroke of the fuel pumps is only about 3/16 of an inch, it will be understood that the operation is very sensitive.

stepped-saddles for the pump-strikers. By moving a hand-lever this friction-shoe is brought into play, and the friction slightly lifts the friction-shoe, the rod and the bracket, clearing the main pump-strikers and thus rendering them inoperative, and simultaneously brings the auxiliary pumps into line with their particular strikers, which, as previously stated, are at the other end of one of the crescent-arms.

This causes an injection of fuel to take place in the 2nd and 4th cylinders when their pistons are on the up-stroke at a point just after the exhaust ports have been closed. Preignition occurs as these pistons are nearing the top centers so that the pistons move back instead of completing their full stroke, thus reversing the direction of rotation. As soon as the shaft commences to run astern, the friction on the shoe stops and the main fuel-pump strikers fall into their original positions, and the auxiliary-pump strikers are put out of action. The engine continues to run astern until this operation is repeated. While it takes considerable space to describe these movements, only a few seconds are required to carry them out with the engine itself.



ENGINE ROOM M. S. BRAMELL POINT—LOOKING AFT
Starboard Motor Can be Seen at Left of Picture, Central Motor in Foreground and Part of Starboard Motor at Right.

To control the engine-speed for any definite period, such as when driving the ship at half-speed, the position of the rocker-arms is altered by means of a hand-lever, which has the effect of drawing the strikers further away from the pump, thus shortening the stroke. By shortening the stroke of the pumps the quantity of fuel injected is smaller—this in proportion to the distance of movement of the crescent arms.

Now we come to the method of reversing. In order to reverse, the main fuel-pumps must be briefly cut-out and the auxiliary fuel-pumps brought into action and instantly vice versa. The accomplishment of this is as simple as it is clever.

On the engine-shaft is a friction shoe, which is connected by means of a rod to the bracket that carries the

Our attention now can be devoted to the trials of the BRAMELL POINT. Except for some dock trials the engines had not previously been run since leaving the test-shops in Sweden, so the performance may be regarded as excellent.

A start was to have been made at 7 a. m., but due to a thick fog on the river, the standby bell was not rung until 10:27 by which time the atmosphere had somewhat cleared. At 10:41 a. m. she backed out of the dock without assistance of any tug boats, two engines only being used. The center engine was started at 11:23

a. m., when the port, center and starboard engines were running at 132, 125, and 130 r. p. m. respectively.

For various sections along the route to the Kent Island measured sea-mile course, the following speeds were recorded, viz.: 7.8 knots, 8.51 knots, and 9.9 knots, on ebb tide running. When the start was made the ship was drawing 11 feet 11 inches forward and 18 feet 4 inches aft; but before the trials water-ballast was pumped in altering the trim and draught to 13½ feet forward, and 18 feet aft, which was bad for the speed, because the ship had virtually to push the river before her.

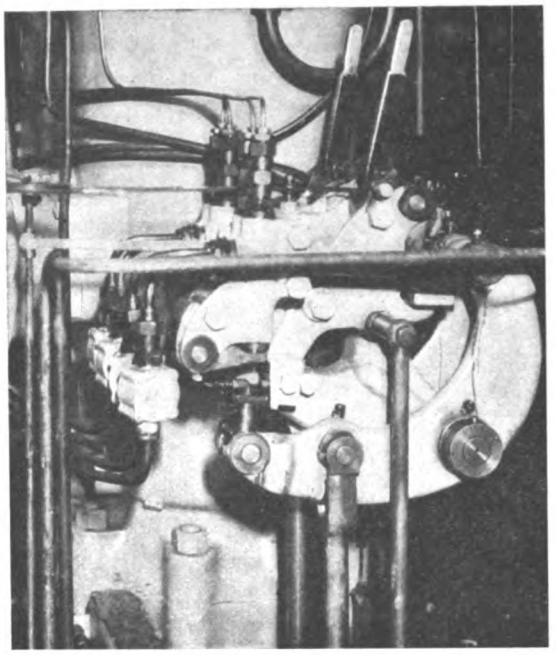
Five single runs were made over the measured sea-mile with three engines and one with two engines, as follows:

	Engine Speeds*			
	Port. r.p.m.	Center. r.p.m.	Starboard. r.p.m.	Speed of ship. knots.
With tide	154	136	144	9.783
Against tide	152	138	142	9.351
With tide	151	137	147	10.465
Against tide	154	142	151	9.574
With tide	154	142	151	10.227
Against tide (two engines)	147	shut down by navigator	144	9.091

*All the engine-speeds were human counted, no mechanical counter being fitted, so they may not be quite accurate.

Thus, the mean speed for the best two runs with and against the tide, was 10.019 knots. After the trials the home run was made for the wharf and altogether about 75 nautical miles was covered during the day. During the entire time the engines ran with absolute reliability, not a single hitch occurring. Unfortunately, the engineers apparently were unable to bring them up to the designed speed of 160 r. p. m. and this must have been due to the stiffness of new engines, or else the propellers not being quite right.

The fuel-oil used on the trial was Pennsylvania Crude of about 19,000 b. t. u., 30 degrees Baume, and with a specific gravity of 0.88. This is a very good oil, but when the ship is in service a heavier fuel will be used. Owing to a mistake by the men attending to the measuring of the fuel in the bunkers, no accurate records of the consumption are obtainable for the first day's trial.



FUEL PUMP MECHANISM
Described on Pages 20-21

On the following day trials were run with the ship loaded. She left the wharf drawing 21 feet forward and 23 feet aft. Four single runs were made, two with three engines and two with two engines.

	Port. r.p.m.	Center. r.p.m.	Starboard. r.p.m.	Speed of Ship. knots.
Against wind and tide	146	144	141	8.276
With wind and tide	147	145	143	10.198
			Mean	9.237
Against wind and tide	143	...	136	7.317
With wind and tide	135	...	133	8.612
			Mean	7.964

As it was again found impossible to bring up the engines to 160 r. p. m. it was decided to decrease the pitch of the propellers. This was done as shown below and a third trial trip was held Sunday, November 5th. The ship was loaded to a mean draught of 22′ 11½″. Four runs were made.

	Port. r.p.m.	Center. r.p.m.	Starboard. r.p.m.	Speed of Ship. knots.
1st run	156	151	152	9.878
2nd run	159	152	156	9.84
3rd run	153	151	151	8.18
4th run	149	148	148	8.07
			Mean	9.00

The writer, who has been able to compare these speeds with those of other motorships, considers the results very good in proportion to the power installed, the propeller speed, and the displacement of the ship.

As a comparison we will give some details of a full-powered Diesel ship of a little smaller size, same power, slower propeller speed and somewhat finer lines. These figures can be relied upon, as they are taken from a vessel in service, and the speed of the Diesel ship always has been considered very good.

	Bramell Point.	Diesel Ship.
Length	306′ 0″	310′ 0″
Breadth	47′ 0″	45′ 0″
Moulded depth	28′ 0″	26′ 3″
Loaded Draught	22′ 8″	.....
Brake Horse Power	1,650	1,650
Propeller Revolutions	150 r.p.m.	125 r.p.m.
Displacement	7,250 tons	7,000 tons
Trial speed (light)	10.4 knots	
Trial speed (loaded)	9.0 knots	10½ knots (135 r.p.m.)
Average sea speed (loaded)	...	9½ knots (125 r.p.m.)
Average sea speed (light)	...	9½ knots
Dead weight capacity	5,500 tons	4,500 tons
Actual cargo capacity	5,000 tons	4,100 tons

Details of the propellers as used on the trials of BRAMELL POINT are very interesting.

They are three-bladed models, and the port and starboard wheel are 8′ 6½″ in diameter, with 7′ 8¼″ pitch, the latter being readjustable from 6′ 11¼″ to 8′ 5½″. The ratio of the diameter to pitch is 1-11. The projected area is 24.51 sq. ft., and the developed area is 27.895 sq. ft. On the final trip the pitch of these propellers was decreased to 7′ 3″.

The center propeller is 8′ 6½″ in diameter, with a 7′ 3″ pitch readjustable from 6′ 03″ to 8′ 04″. The ratio of the diameter to pitch is 1-18. The projected area is 24.51 sq. ft., and the developed area 26.645 sq. ft. On the final trial trip the pitch was 6′ 6.3″.

As regards the engine room and the auxiliaries. The former is 44 feet long by the width of the ship at the after end. The center engine is laid about 4 feet lower than the two wing engines. Over the engine room is the boiler room, where are installed two boilers for the steam auxiliary machinery and steering gear and for the cargo pumps respectively, one boiler always being kept working at 100 pounds per sq. inch pressure. For the engine room auxiliaries there are steam-electric generating sets.

The machinery and living quarters are located aft, there being a funnel acting as up-take for the donkey-boiler and also carrying the exhausts from motors; there are two masts, each having cargo booms, served by steam winches. There is a raised forecastle forward for sea-going purposes, and for housing-in the windlass.

In the hull there are seven transverse bulkheads with a fore and aft or longitudinal bulkhead and amid-ships, dividing the hold into twelve tanks; but the upper portion of the tank space in the wings port and starboard is separate. The main tanks are carried up and form a continuous expansion trunk running over all the tanks. This leaves the wing tanks independent and available for cargo when weather conditions will permit deeper loading.

Since the above was written, the BRAMELL POINT has very successfully completed her maiden trip from Baltimore to New York in forty-six hours, the average speed of the engines and of the ship being 155 r. p. m. and 10.4 knots respectively, where she took aboard her cargo and then left for Europe. The working of the BRAMELL POINT at sea under ordinary mercantile conditions will closely be watched by shipowners in general.

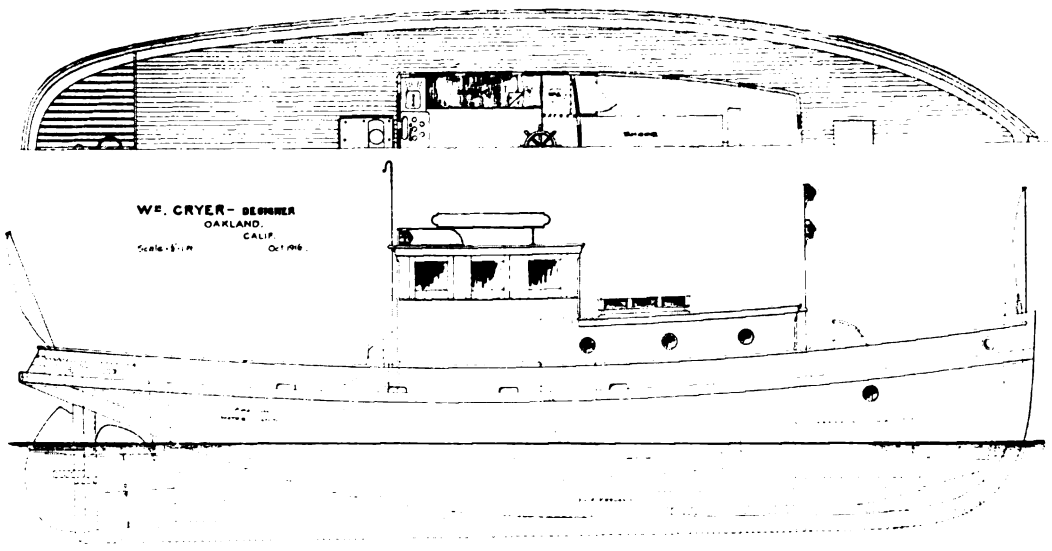
NEW BOATS FOR ALASKA PACKERS.

The power boats built last year for the Alaska Packers' Association by Wm. Cryer, of Oakland, were among the finest vessels of their size that have ever gone out from San Francisco, and Mr. Cryer (who has recently taken his son into partnership) is now getting out the plans for four more boats for the same concern.

Two of these boats will soon be under construction. They will be identical in design and specifications, being 75 ft. long, 16 ft. wide, with a moulded depth of 6 ft. 4 in. Though drawn on fine lines, they will be sturdy sea-boats, with 12 by 12 in. Oregon pine keels and sister keelsons, oak stem and sternpost and heavy deadwood, and 4-in. bent oak frames throughout. There will be an ironwood shoe on the keel, and guards of the same material. They will be ceiled throughout with 2-in. Oregon pine, and planked outside with 2½-in. plank. They will be schooner rigged, with sail to give them a fair speed without power, having 35-ft. masts. The engine room will be placed amidships, being 11 ft. long, with a pilot-house at the after end, containing a fixed and a folding bunk, toilet, etc. The forecastle, located in the hold forward, will have accommodations for six. Just abaft the pilot house will be a galley, with stove and tables, etc., 8 ft. long. A Dayton electric lighting outfit will be installed, including dynamo and storage battery; and there will be two 300-gallon fuel tanks and a 1,000-gal. water tank in each boat. These boats will be powered with 110 h. p. S. F. Standard engines.

The two A. P. A. smaller boats will be 55 ft. long over all, with a beam of 14 ft. and 7 ft. depth of hold. The keels will be of single-length Oregon pine 8 by 12 in., with an ironbark shoe, and the stem and sternpost of California laurel. The keelson will be 10 by 12 in., with sister keelsons 10 by 10 in.; and the frames will be of bent oak, tapered from 3 by 5 at the heel to 3 by 3 at the head. The garboard and top strakes will be of 3-in. Oregon pine, the rest of the planking of 2-in. ship plank. The decking will be 3 by 4-in., and the boats will be ceiled throughout with 2-in. stuff. There will be 3 by 10-in. ironbark fenders.

A small forecastle under the forward deck will provide sleeping accommodations for three men. The engine room will be well forward, with a stoutly-built pilot house immediately aft, arranged for one-man control of engine and steering gear. The engine will be a 75 h. p. Frisco Standard. A 10-light Dayton electric outfit will be installed in each boat, with dynamo operated from the main shaft. The boats are intended mainly for towing among the canneries.



55-FOOTER FOR ALASKA PACKERS ASSOCIATION

NEW QUARTERS FOR JOHNSON LAUNCHES.

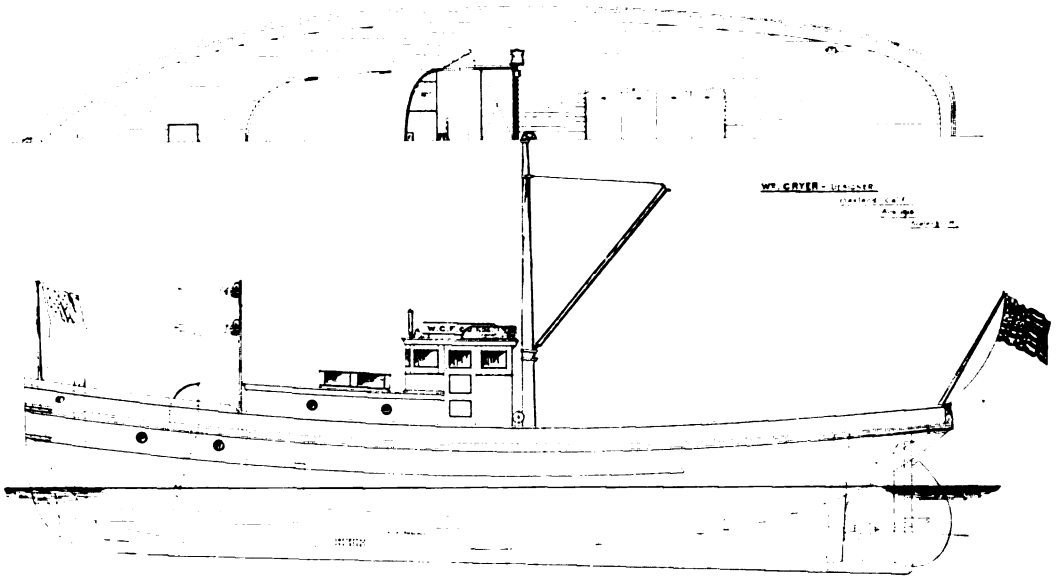
Capt. Harry Johnson, one of the oldest of the gasoline launch operations on San Francisco Bay, has moved to new quarters on the bulkhead between Piers 24 and 26, recently completed. While the piers were being built he made his headquarters on the other side of the Embarcadero.

BUILDING NEW POWER TRAWLER.

While the San Francisco fishermen are extremely conservative, it is becoming evident that the great economy of labor and space, as well as fuel, made possible by the internal-combustion engine is gradually winning a place for this type of power as against the steam power which has always prevailed in the past in the power trawling fleet of San Francisco. The first gasoline boat for deep-sea trawling was built a few months ago by the San Francisco International Fish company, and has given very satisfactory service. The latest example of the innovation is a much larger boat now being built for the Western-California Fish company by William Cryer & Son, of Oakland, which is expected to be far and away the finest boat in the local fishing fleet.

The boat, which is designed as well as built by Cryer & Son, will be ready for launching in a few weeks. She is 60 ft. long, 15 ft. wide, and has a moulded depth of 6 ft. The power will be a 3-cylinder 80 h. p. Frisco Standard engine, which is expected to give a speed of about 12 knots.

The boat is very substantially built, having a heavy Oregon pine keel, with sister keelsons on the style of large vessels; hardwood stem and sternpost, with plenty of deadwood fore and aft; and 3x3-in. bent oak frames. The deck beams are 6 by 6, and both planking and deck are 2-in. Oregon pine, the ceiling is similar material; and all important joinings are braced with substantial knees. The gunwale and guard all round, as well as the hatch coaming, are faced with ironbark.



60-FOOTER FOR WESTERN CALIFORNIA FISH CO.

A commodious forecastle provides accommodation for extra hands if required. The light airy engine room is placed just forward of amidships, following the accepted style of San Francisco trawlers, covered by raised skylight. Fuel tanks are placed on either side under the deck. Just aft of this is the pilot house, also quite roomy, in which will be placed one-man control gear for engine-control and steering, together with several bunks. The pilot-house is entered from doors on either side. Attached to the rear wall of the house is the usual trawler winch for handling nets, and a cargo mast will be placed here to facilitate handling the fish. Astern is a roomy fish hold, with a special fish hatch with high coaming, and considerable deck space on which fish may also be placed.

ENORMOUS MOTORSHIP PROFITS.

Special attention of steam shipowners is drawn to the article on steam and motorship comparisons, and it is to be hoped that time will be found for a thorough investigation of the figures put forward. It is shown there that a fleet of 12 Diesel motorships means in excess of two million dollars per annum to the good, in comparison with a fleet of 12 geared-turbine oil-burning steamships under exactly similar conditions.

THE LATEST PRODUCER-GAS VENTURE.

Every once in a while we hear of new producer-gas engined boats, and a fairly large vessel is now under construction in Holland at the yard of Verschure & company of Amsterdam. This is the "Wilhelmina," a ship of 640 tons gross, which will be equipped with a 6-cylinder Van Rennes gas engine constructed by the Drakenburg Engineering works of Utrecht. Her length is 147½ feet by 25½ feet beam and 12 feet 1 inch moulded depth.

POPULARITY OF MOTORSHIPS IN SWEDEN.

There are now 146 motorships in Sweden, having a total tonnage of 31,175 tons, of which 83 are auxiliaries with a tonnage of 4,200.

ITALY'S FIRST MOTORSHIP.

The well-known motorship "Christian X," built by Burmeister & Wain for the East Asiatic company, but sold to the Hamburg American company after a consultation between Kaiser Wilhelm & Herr Ballin some years ago has been acquired by the Italian government, and we should not be surprised to see her sold to some Italian shipowning concern, in which case she will be the first large mercantile ocean-going motorship owned in Italy, although Italy has done a great deal in developing the marine Diesel engine. The attention of her various engineers has mostly been confined to naval craft, although there are a number of Diesel-driven coastal craft in service in Italian waters.

SHIPPING MEN CHANGE QUARTERS.

The Merchants Exchange of Seattle, after leven years in its old location on Marion street, will move about Dec. 1st to more commodious quarters in the New Arctic building at Third avenue and Cherry. The new quarters will connect with the main and private dining rooms of the Arctic Club which shares the entire fourth floor of the building.

A great deal of the success of this organization may be credited to the able secretary, Mr. Robt. Hill.

SWEDISH GOVERNMENT ASSISTS SHIPBUILDERS.

We referred in a recent issue to a large number of motor vessels now on order to the order of the North Star company of Stockholm, Sweden. Towards the construction of these boats a loan was obtained from the Government finance department to the total of 750,000 kronen ($225,000). A special sum has been provided for assisting shipowners along these lines by the Swedish government.

DEATH OF SIR WILLIAM T. DOXFORD.

We regret to announce the death of Sir William T. Doxford, head of the great British marine engineering firm of William Doxford & Sons, of Sunderland. He spent considerable sums of money in developing the marine Diesel engine, and originally built a 2-cycle type Diesel engine of their own design, which they abandoned in favor of Junkers-type opposed-piston Diesel motor, which also was of the 2-cycle type. In their shops they have a single cylinder engine which developed 500 b. h. p. at 112 r. p. m. for a five weeks' continuous trial, running night and day, under the supervision of the surveyors of Lloyd's Register.

"NUUANU" ARRIVES IN SEATTLE.

This converted tanker featured in our last issue made a most successful run to Seattle from 'Frisco. David Dorward, Jr., who supervised the installation, reported that her Bolinder ran like a watch, everything sweet and cool and perfectly satisfactory to her owners, the General Petroleum Co.

ASTORIA CONTRACTOR GOES EAST.

F. C. Harley, a prominent Astorian, has again left for New York, from where he returned only recently, to make final arrangements on his contracts with Eastern owners for wooden motorships.

Mr. Harley will not decide until his return whether to open a new yard or to "farm out."